Industrial

February 1946

Standardization

In two parts—Part I

Howard Coonley

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(see page 29)

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Company Members—

Some 2000 Industrial concerns hold membership either directly or by group arrangement through their respective trade associations

Readers Write

Safety Requirements for Convalescent Homes?

Hartford Accident and Indemnity Company

Gentlemen: We are giving quite a bit of thought to the safety requirements for convalescent homes and have been told that the American Standards Association is working on a code for such homes.

G. B. BUTTERFIELD
Secretary

• • The American Standards Association does not have any project going forward at the present time in regard to safety requirements for convalescent homes. The project on fire protection and fire resistance might apply since it covers all types of buildings. The project is in the early stages of development and it will be quite a long time before all of the controversial matters have been ironed out and a code submitted to ASA for approval.

German Standards Available

Library of Industrial Research

Gentlemen: We would like to secure a list of German standard end mills in the cutting diameter range of 3/16 in. to 2 in. Any assistance you can give us in securing such a list of standards will be of inestimable value to us and will be very greatly appreciated.

E. L. HAVILAND
Research Department

• • The American Standards Association informed the Library of Industrial Research that the following German Standards are on file in the ASA library:

DIN 366 End Mills with Morse Taper
(size range 8 to 40 mm)
DIN 327 End Mills with Cylindrical Shank
(size range 8 to 40 mm)
DIN 328 End Mills, Double-Ended
(size range 2 to 10 mm)

A French standard sheet, CNM 223 Two-lipped Mills, and a British Standard for Milling Cutters and Reamers, 122-1938, are also available.

Congratulations!

Western Union Telegraph Company

Gentlemen: We appreciate very much the good work on standardization you have done and are doing and we depend on it to a large extent for our company standards.

F. E. D'HUMY
Vice-president in charge of engineering

Pratt & Whitney Division
Niles-Bement-Pond Company

Dear Dr. Gaillard: I wish to compliment you on your article on "Preferred Numbers" in the November 1945 issue of INDUSTRIAL STANDARDIZATION. You have presented the subject in a very comprehensive manner, and it is a subject that is well worth the effort.

F. O. HOAGLAND
Master Mechanic

X-Ray Protection in Czechoslovakia

Czechoslovak Economic Service in U.S.A.

Gentlemen: The Czechoslovak Ministry of Labor is preparing new regulations concerning the protection of x-ray operators and technicians. I would therefore appreciate your kind cooperation in sending me the wartime American Standards concerning the x-ray installations.

J. STOLZ
Advisor on Social Legislation

• • The American Standards Association was pleased to let the Czechoslovak Economic Service have copies of the proposed American War Standard Safety Code for the Industrial Use of X-Rays. It is expected that the standard will be approved within the next few weeks.

Standardizing Microfilm

National Microfilm Association

Gentlemen: I have found among libraries an active interest and desire for a set of standards to cover library microfilm. Libraries feel that there should be some yardstick that they can apply to film which they are purchasing, enabling them to judge whether or not it is of suitable quality.

EUGENE B. POWER,
President

• • A copy of Mr. Power's letter was sent to the chairman of the ASA Sectional Committee and Mr. Power was invited to discuss the problem further with the ASA staff.

Our Front Cover

Howard Coonley, member of the Board of Directors and Executive Committee of the Walworth Company, formerly president of the Walworth Company, past-president of the National Association of Manufacturers and of the American Standards Association, head of the WPB Conservation Division during the war, recently advisor to China in setting up the Chinese War Production Board, has now been named chairman of the new Executive Committee of the ASA (page 29).

Industrial Standardization

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February, 1946 Ruth E. Mason, Editor 35 Cents

Standardization is dynamic, not static. It means not to stand still, but to move forward together.

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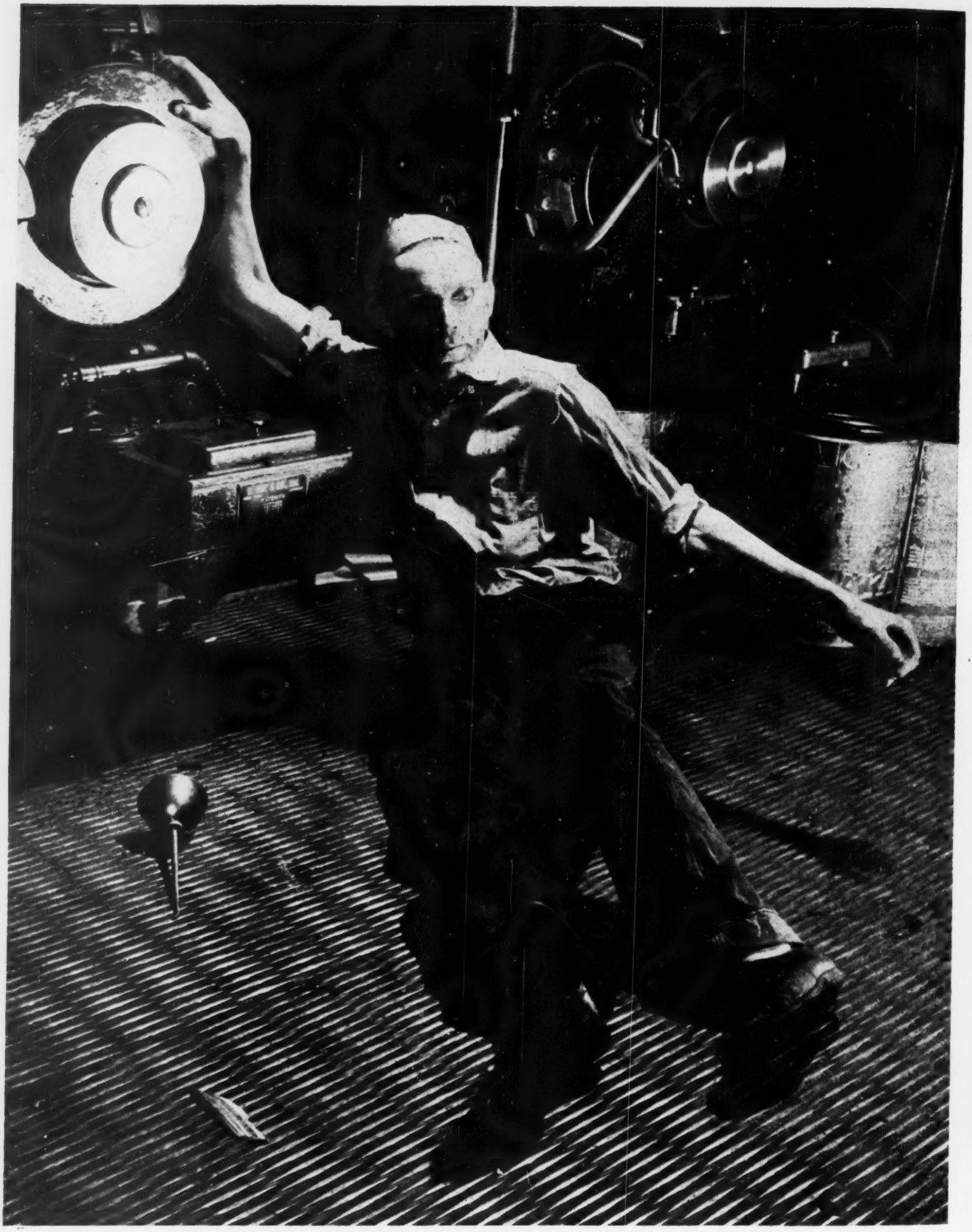


New rules for classifying industrial accidents and for compiling frequency and severity rates are given in the new edition of American Standard Z16.1-1945.

See article on page 44.

Coonley Heads New Committee to Broaden ASA Activities

THE organization by the American Standards Association of an Executive Committee headed by Howard Coonley has been announced by Henry B. Bryans, president of the ASA.

The work of the new committee will have to do with the financial, administrative, and executive direction of the American Standards Association. The committee will be charged with the responsibility of making provision for meeting the greatly increased responsibilities placed upon the Association by the report to the Secretary of Commerce of the committee of nationally prominent industrial executives headed by Charles E. Wilson, president of General Electric Company. The report of this committee recommended that the scope of the American Standards Association should be broadened so that it can handle any standards or standardization project that deserve national recognition, and that the Association be strengthened so it can manage this broad program effectively. This report was published in full in the July, 1945, issue of INDUSTRIAL STANDARDIZATION, page 145.

Calls Attention to Wilson Committee Statement

Referring to the relative roles which government and industry should play in standardization activities, Mr Bryans called attention to the statement of the Wilson Committee that:

"Standards will ultimately affect the production and sale of all goods. With this belief, it becomes evident that provisions must be made for the orderly development of all standards.

"The Committee believes that standards activities which involve negotiation, opinion, judgment, or compromise, should be developed through individual and joint efforts of technical, manufacturing, merchandising, and consumer groups.

"The Committee also believes that these efforts will need to be co-ordinated and promoted through a disinterested private agency organized to function in the broad public interest. It appears that this function can most logically be fulfilled by the American Standards Association."

The report adds that in standardization activities, the Federal Government can make its most valuable contribution by developing needed technical data by means of research and factual studies, rather than by operating a standardizing agency.

Coonley to Give Nearly Full Time to ASA Program

Mr Coonley, past president of the American Standards Association and of the National Association of Manufacturers, has just retired from his active duties as chairman of the Board of the Walworth Company. While continuing as a director and member of the company's Executive Committee, he plans to give virtually full time to directing the program of development of the American Standards Association.

"Mr Coonley's position in industry and in the field of standards is unique," Mr Bryans declared. "He is a former president of the National Association of Manufacturers and of the American Standards Association. As an associate of Charles Schwab serving as vice president of the Emergency Fleet Corporation during the First World War, he played a major role in standardization activities in the ship-production program. He organized and has for many years been chairman of the Manufacturers Standardization Society of the Valve and Fittings Industry. During the Second World War he headed the conservation, standardization, simplification, and specification work of the War Production Board. His success there led to his selection as adviser to the Chinese Government in setting up the Chinese War Production Board and getting it into actual operation."

Four Members of Board Serve on Executive Committee

Serving with Mr Coonley on the Executive Committee of the ASA are the president and vice president of the Association and two members of the Board of Directors. They are:

Henry B. Bryans, President of the ASA and Executive Vice President, Philadelphia Electric Company

Frederick R. Lack, Vice President of ASA and Vice President, Western Electric Company

Clarence L. Collens, Chairman of the Board, Reliance Electric and Engineering Company

George H. Taber, Jr, President, Sinclair Refining Company.

Ten Engineering Meetings Scheduled by SAE in 1946

Ten national engineering meetings have been scheduled for 1946 by the Society of Automotive Engineers.

March 4, German Engineering Evaluation Meeting, Detroit, Mich. "Conversion of German automotive engineering data, techniques, materials, and progress to the uses of American industry—"

April 3-5, National Aeronautic (Spring) Meeting, New York.

June 2-7, Summer (Semi-Annual) Meeting, French Lick, Ind.

Aug. 22-24, National West Coast Transportation and Maintenance Meeting, Seattle, Wash.

Sept. 11 and 12, National Tractor Meeting, Milwaukee, Wis.

Oct. 3-5, National Aeronautic (Fall) Meeting and Aircraft Engineering Display, Los Angeles, Calif.

Oct. 16-17, National Transportation & Maintenance Meeting, Chicago, Ill.

Nov. 7 and 8, National Fuels and Lubricants Meeting, Tulsa, Okla.

Dec. 2-4, National Air Transport Engineering Meeting, Chicago.

Standardization Tomorrow?——

What the Aircraft Industry Has Accomplished And a Plea for Cooperation Throughout Industry

By B. C. Boulton

Engineering management, particularly in the aircraft industry, is urged to lend more active support to the general trend toward standardization. In this paper examples are given indicating the extent of the improvement in product quality and the cash dividends which have accrued through standardization. Important developments in standardization work are noted and suggestions are given which should make efforts in this direction more effective in the future.

TOO often in a busy engineering department, overloaded with design work, standards engineers are just tolerated or considered as overhead, necessary perhaps but not productive in so far as getting on with the main job is concerned. As for having responsible design engineers spend time on standards work —that is just too much even to consider. When pressed, engineering executives will generally agree that standardization has some value but that the benefits are too intangible and too far in the future to warrant more than a low priority for standards work in comparison with today's urgent tasks.

***B. C. Boulton** is a member of the Engineering Divisional Staff, Douglas Aircraft Company, Inc, Santa Monica, California.*

If standardization is as important as many who have studied the problem feel, who is responsible for the too general attitude toward it among our operating managements? In considerable part it is felt that the responsibility lies squarely on the doorstep of the standards organization and to a lesser extent of the standards engineer. Because of absorption in their technical and organizational work, they have quite neglected the public-relations function, which is so uniquely important in standardization. The burden of proof that this function may be a highly profitable investment, paying handsome dividends, and recurring ones, is up to those backing it. It must not be overlooked that these dividends are often in the form of enhanced quality of product, frequently not obtainable any other way. Discussion and generalities have their value, but in this campaign specific facts and figures are needed to convince. Sporadic efforts to present the case are not effective. They must be repetitive and carefully planned with attention given to the manner of presentation. Above all they should be directed toward business and engineering executives —not standards engineers or the general public. Publicity should stress not only the positive side—the gains and achievements—but also the negative side—the frequent high costs, inefficiencies, and inadequate technical quality due to lack of standardization.

NOTE: This paper was presented at the Aviation War Conference, Los Angeles, California, June 11-14, 1945, of the American Society of Mechanical Engineers, and published in the November, 1945, issue of *Mechanical Engineering.*

Examples of Standardization Which Paid Dividends

In this section of the paper a few examples will be presented, some from experience of the author's company, others contributed by engineers from other companies.

High-Strength Internal Wrenching Bolt.—The story of the high-strength internal wrenching bolt, Fig. 1, as used on the Douglas C-54 makes a good beginning. These bolts were originally of Douglas design to conserve weight and space. Table 1 summarizes the price picture before and after standardization. The extraordinary decrease in cost is due largely to more efficient manufacturing methods and the greatly increased production because of wide usage resulting from standardization.

This thoughtful paper on standardization in the aircraft industry, by a man who is well recognized as an authority in his field, offers a challenge to every individual interested in standardization.

As all concerned with the development and application of standards well know, standardization is a difficult subject to sell. Frequently its benefits are of a general nature, as Mr Boulton points out, and cannot be expressed in dollars and cents. That it is to be of increasing importance in the postwar production picture, however, was indicated recently when the General Electric Company made its Standards Division a part of its Executive Department, thus recognizing standardization as a function of management.

Comments on Mr Boulton's paper, and on the promotion of standards in other industries, will be welcomed.

During that process, design changes produced a stronger and lighter bolt, the weight saving amounting to 8 lb per airplane in the case of the C-54.

Table 1. Internal Wrenching Bolts
(Used on the Douglas C-54)

Diameter, in.	Bolts per airplane	Cost per airplane: Douglas design	Cost per airplane: NASC* standard	Saving per airplane
1/4 and 5/16	39	$ 49.70	$ 8.34	$ 41.36
3/8 and 7/16	56	91.49	16.77	74.72
1/2	96	166.00	44.00	122.00
5/8, 3/4, and 1	26	51.44	20.78	30.66
Total	217	$358.63	$89.89	$268.74

* National Aircraft Standards Council (NASC).

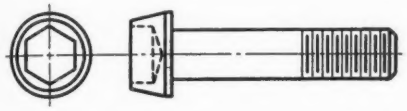


Fig. 1. Internal Wrenching Bolt

The cost savings approximate well over $600,000 for the total contracts involved. Without national standardization there would undoubtedly have been some reduction from the prices paid for the Douglas bolts but nothing comparable to the savings shown. That standardization of a single class of parts on one type of airplane only should have such an economic effect is startling.

Aircraft Ball-Bearing Pulley.—The next example is of unusual interest for other reasons: (1) Because it is an item used for years by the millions without critical thought; (2) because the standardization has as its objective improved functional quality, cost reduction being a by-product; and (3) because the man who initiated and is conducting the work is not a standards engineer but R. R. Richolt, hydraulic and mechanical staff engineer for Lockheed.

The article which offended Mr. Richolt's sense of design fitness so that he finally decided to do something drastic was the aircraft ball-bearing pulley. The development of over 300 special pulleys in current use, similar to the AN210 series, came about as the result of the latter's inadequacies.

In working up the design of the proposed NASC series, Fig. 2, the subcommittee first made an analysis of the functional and design requirements. The basic change is in the pulley capacity ratings which are based on the "limit" load in the airplane cable system. The resultant pulley load, with a safety factor of 2, and the allowable bearing stress of the sheave material determine the sheave design. With the AN (Army-Navy) series, only the bearing was protected by the rated capacity and the sheave could be so overloaded as to cause early failure. To aid the designer in intelligent selection of a pulley for a specific application, with due regard for pulley and cable life, the NASC standard drawings will contain two S-N curves, one for the sheave and one for the cable, Fig. 3.

The bearings will be specially designed to meet pulley requirements. The hubs will project sufficiently to provide adequate clearance and will be wide enough to permit a double-row ball or needle bearing that will be much lighter and give more stability than the present single row. An important feature of the secondary-control pulleys for engine controls is provision, in two sizes, of a 0.625-in. bore to permit gang mounting on a tube. The proposal also includes pulleys capable of being aligned within 2-deg limits and locked, primarily for prototype and early-production airplanes. The more efficient pulley design possible when definite performance specifications are furnished makes possible a weight saving on flying-control pulleys of about 40 percent.

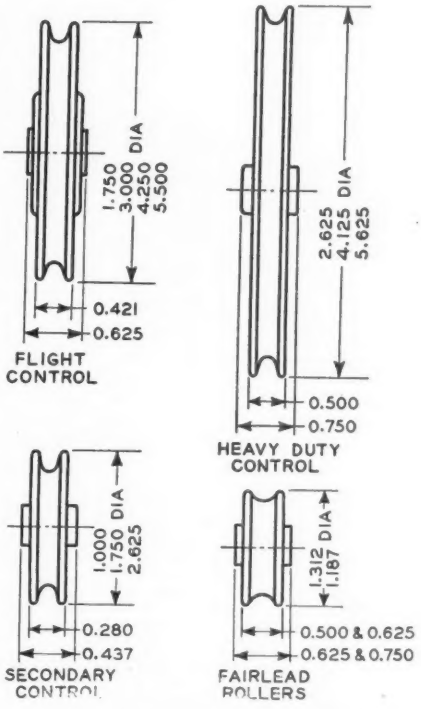


Fig. 2. Proposed NASC Pulley Standards

Because it shows so clearly why a properly developed modern standard excels from both a quality performance and production viewpoint, a summary is given of the development of the NASC pulley. The initial proposal was prepared by Mr. Richolt and a representative of a bearing manufacturer; this was presented to the NASC controls subcommittee and their suggestions incorporated; a design-policy questionnaire was sent to all aircraft companies for comment; then a conference was called of 12 leading pulley and bearing manufacturers, and their experienced representatives, working with two aircraft engineers, studied it in detail and made recommendations; a special panel representing the three groups concerned was chosen to draft the final design envelope and performance requirements; these have now been submitted to all aircraft companies for final comment and approval.

Once the pulley and bearing manufacturers understood that the proposal was for postwar manufacture and would not upset war production, they were heartily in favor of it, as they have experienced difficulties under present conditions and do not relish manufacturing 300 special pulleys. Under the proposal, 20 pulleys cover all requirements, including those for heavy-duty and fair-lead pulleys, and will not have to be supplemented except in minor degree. Their cost will be about the same as for AN210 pulleys. A large cost saving, however, will occur as a result of elimination of the "specials".

Hydraulic Fittings.—In complete contrast to the preceding example is the case of standardization of the AC811 series of hydraulic fittings, Fig. 4. For new design and some current models, this series was superseded by a new series of AN fittings, but for several airplanes in large production no change was made. The AC811 series was originally proprietary and made by one manufacturer. However, procurement demands were so great that several sources had to be developed. One difficulty was that the available drawings, as released by the Army, were not completely dimensioned; critical dimensions were specified by calling out a tool number. Much confusion arose in interpreting these drawings, and supposedly identical parts produced by different vendors differed.

Finally the Lockheed Company sponsored an NASC project for the

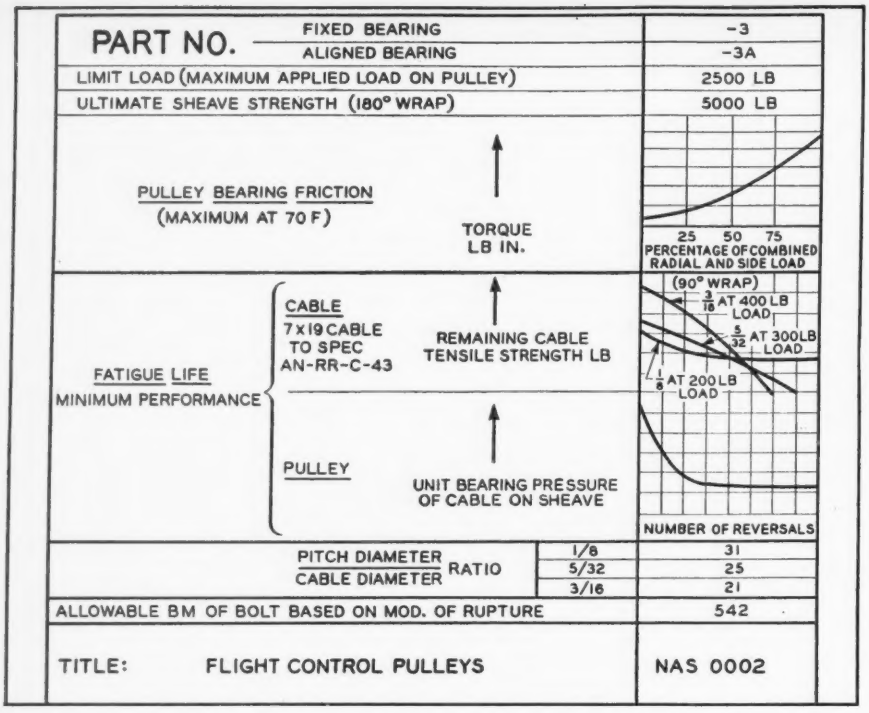


Fig. 3. Engineering Data on NASC Pulley Drawings.

preparation of a set of standard drawings. Slight changes in design and in tolerances made it possible to machine the fittings with standard tools on automatic equipment, saving considerable tooling and manufacturing time. The NASC proposal was presented to the Services and resulted in issuance of WPD Directive 6-W-2. Large cost reductions resulted, as shown in the case of typical parts itemized in Table 2.

Table 2. AC811 Straight Connector Fittings

Part no.	Priced based on: Original drawings	NASC drawings	Reduction, percent
HT 12 D	$0.57	$0.26	54.5
HT 4 D	0.114	0.087	23.5
CT 5	0.22	0.128	42.0
HT 8 6 D	0.36	0.20	44.5
HT 6 D	0.231	0.10	56.5

In 1944 the Lockheed Company, as a result of this work, saved $406,000 over previous prices and greatly facilitated its procurement. In this instance, standardization did not change functional quality but powerfully affected economic efficiency.

Fuel-Cell Fittings.—The next illustration, contributed by North American Aircraft Corporation, is typical of extremely useful standards work and is of great interest because it demonstrates the considerable savings in engineering design time, which frequently result from standardization. It is the design of a set of standard self-sealing fuel-cell fittings, undertaken by the Air Technical Service Command in co-operation with the major rubber companies. These cover various sizes of single-and two-plane fittings from which an engineer can select in designing a fuel cell.

Prior to the advent of these standards, a choice might be made either from a multitude of existing fittings, if drawings were on hand, or a new fitting drawn up. In general, molds for existing fittings were available to only one or two vendors. If an order were placed elsewhere, the cost of new tooling and a procurement delay of 3 months or more were involved. Now, each vendor has molds for all standard fittings. Thus this standardization project has the following advantages:

1. Provides a set of standard fittings from which an engineer can choose, eliminating investigation into available nonstandard types, except in unusual cases.
2. Eliminates the necessity for detailing fittings with each cell. In a typical case, 48 drawings and 500 engineering hours were required for such drawings for one new tank.
3. Reduces procurement time and cost.

Surface Finish.—The NASC project for the development of standards to designate surface finish would appear to be of the somewhat theoretical type with the practical benefit rather long range and a bit hazy. Judging from the recent experience of North American Aircraft Corporation (NAAC) quite the contrary is true. The benefits have been most tangible in the form of 15 percent reduction in scrap, and 40 percent reduction in rework of hydraulic parts. In addition to these gains, the foreman of the machine shop stated that the clear designation on the drawing of the quality finish desired on specific surfaces saved much time formerly wasted in misapplication of effort. It had eliminated time-consuming arguments between shop and inspection, and the necessity for frequent contacts between engineering and the shop, particularly important in the case of outside production. Parts from the machine shop are of more uniform quality than before the adoption of the NASC designation of finish in microinches and the use of standard comparators to measure it. Leakage problems have almost disappeared.

No attempt is made to place a monetary value on such results. The economic gain to industry from a standard which provides a means for designating quantitatively and measuring qualitatively the surface finish is self-evident. Although the aircraft industry has adopted as its unit of measurement the "rms or root-mean-square" value of surface irregularities, the acceptance of this unit is by no means universal. There are five other proposed systems of measurement, each with strong proponents. The need is urgent for a meeting of minds and a redrafting in definite form, for national and international use, of the American Standards Association's (ASA) B46 standard on surface finish.[1]

Hose Clamps.—The importance of an intelligent approach in the choice of a standard to meet design requirements is well demonstrated in connection with drawing revisions changing hose-clamp usage on the Douglas C-54 airplane. Instead of using the more expensive and heavier AN-748 clamps for all purposes, their use was restricted to fuel, oil, coolant, and hydraulic lines, which

[1] An American Standard on Surface Roughness, Waviness and Lay, B46.1, is now being completed by a sectional committee sponsored by the American Society of Mechanical Engineers and the Society of Automotive Engineers.

constituted 15 percent of the total of 1000 clamps employed, and at the suggestion of the standards engineers, another type was employed for all instrument, vacuum, deicer, air-vent, and drain lines composing the remaining 85 percent. This decision saved on each airplane some 50 lb weight and $42 or about $100,000 total not including an almost equal saving in installation time.

Adjustable Hose Clamps.—A type of saving which standards engineers are constantly making is illustrated by the adoption of a type of hose clamp, with a wide range of adjustment. The wide variation in wall thickness of hose and the consequent production difficulty in selection of the proper size of clamp made this change important. Prior to converting to the new type, one North American Aircraft (NAAC) model required the stocking of 30 sizes which the new clamps cut to 7. The cost of inventory and stocking, handling, and selection of proper size was considerably reduced.

It is appropriate to remark that NAAC standards engineers, as a result of sponsoring the NASC project on hose clamps, were largely responsible for the development and introduction of the new clamp through assistance rendered the vendor in the form of engineering advice and testing over a long period. The same procedure is characteristic of the development of many valuable vendor products. It might also be pointed out that standardization results from wide acceptance and usage. Many parts used in large quantities on numerous models, even though not blessed by an AN, NASC, or other official standard designation are nonetheless true and valuable standards, having won their way by merit.

Hose Lengths.—A final example, not of the spectacular type but rather one showing the slow, steady gains in industrial efficiency brought about by standardization, was suggested by NAAC also. This was a standardization of hose length for each inside diameter of hose. Before that action, the draftsman chose the length of hose for connections in ¼-in. increments according to his judgment, and the number of cut sizes carried in stock totaled about 55. Since standardization, this number has been reduced to about 13 with the familiar story of decreased purchasing, stocking, inventory, and handling costs.

Although only a few examples have been given of the almost countless number available, they have been chosen to demonstrate the various ways intelligent standardization brings about major improvements in product quality, lower product cost, and lower over-all manufacturing costs, not to forget overhead costs, reduced procurement time, and greater availability due to increased sources. These benefits are not intangible and not long-range; they are here and now; they do not stop but are permanent gains paying dividends month after month. In postwar industry it will be the individual company's money on fixed-price contracts which will be saved.

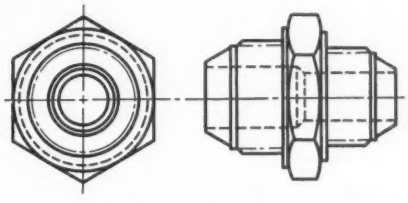


Fig. 4. AC811 Straight Connector Fitting

As this paper brings out later, the fields for the application of the standardizing principle are rapidly broadening—not narrowing. The highly trained design engineer is entering the picture to an increasing extent. While the need will remain for a specialized standards group in each company, there must be recognition of the necessity for some decentralizing of the standards function in engineering, for some participation by high-type design personnel.

The benefits from a standard are more than proportional to the quality and soundness of that standard. These in turn depend directly on the ability and experience of the men responsible for its formulation. We need a budget of engineering hours for standards work, reasonable in amount but honored, and not granted grudgingly. Most important of all, top engineering executives should make clear, down the line of organizational authority through the operating level that, when the need arises, a design engineer should be assigned to standards work as a part of his legitimate activity so that he is not made to feel that he is neglecting his job and his company's interests.

The Process of Standardization

What is the nature of the standardizing process? The term, in the popular conception, is frequently a misnomer and the cause of a prejudice which hampers standards work. A brief analysis may be helpful in creating an understanding of standards. Co-operation is the basic element in standardization. Standards work involves the pooling of the widely varied knowledge and practical experience of able specialists. It serves to focus intensive thought on a particular problem and brings about a consideration of all its aspects. It is often a revelation to discover how great are the possible improvements that become evident under scrutiny in parts which may have been given broad but uncritical use for years. This process of creating a standard, the focusing of attention on a limited field, the clash of viewpoints, and the sincere group effort to secure the best result give to properly developed standards a quality that is seldom found in normal design. The process has a by-product of a value not often appreciated or even recognized. In a new or difficult field, 90 percent of the effort may be expended before the actual work of drafting a standard begins. The discussions, however, crystallize thinking and assist in establishing basic principles on which sound design can proceed. Sometimes a year or more may pass before a concrete standard is evolved.

Standardization is one important answer to the increasing complexity and multiplicity of today's technical developments. Some aspects of these are so great as almost to overwhelm us, or at best to serve as a serious drag on our industrial efficiency, unless brought under control by organization and systemization of details. Designers dealing with new problems are not too keenly aware of the seriousness of the trail left behind them, which must be dealt with by manufacturing, stores, and maintenance.

The rapid tempo of recent times has made evident a trend worth noting because it is a partial answer at least to one of the chief barriers standardization has always faced, namely, the fear, as our English friend Mr. G. H. Nash phrases it, which many able designers have of standardization. This is a sort of claustrophobia, a feeling that once a standard has been set up it is a fixed, dead thing. Any study of recent standardization indicates that the contrary is true; it is a progressive dynamic process. Yet the fact that a standard is a flexible and living

creation and may be changed in a year to incorporate features making it a better standard does not affect its value as a standard, controlling for a period of time the design of a product as does a jig or fixture which is likewise subject to change.

Trend Toward Standardizing Complex Parts and Assemblies

One of the broad trends in standardization work that has become increasingly evident within the last year or two is the enlargement of its scope. While much remains to be done in the matter of standardizing simple or "element" parts, the standardization of the more complex parts and assemblies opens another extremely important and relatively new field. Certain airplane components because of their nature have always been in effect standards, in that the same items are used on many types of airplanes. Such components are engines, propellers, wheels, tires, brakes, instruments, and many equipment items. Designers are accustomed to having these furnished and with few exceptions accommodate the airplane design to their dimensional and functional requirements. However, other parts through precedent have always been considered as under the airplane designer's control and are normally special for each airplane. They constitute a field somewhat jealously guarded by designers.

Owing to the aggressive action of the NASC electrical and hydraulic subcommittees, the lines have started to crumble in a number of places during the last year. It was found, in the case of circuit breakers, connector panels, relief valves, hand pumps, and 4-way selector valves, that technical requirements made it necessary to take co-operative action, through standardization, in order to secure proper function and quality. Naturally, a reduced cost followed the standardization. The point to be emphasized is that technical requirements compelled better design and better tooling than is generally possible in the case of a specific design for a given airplane.

With other parts or assemblies more intimately affecting the airplane, there is still the strong feeling that they must be tailored to the individual airplane, necessitating new design and new tooling in each instance. It is felt that this is a debatable assumption, that there are not a few instances where a really well-engineered design would be suitable for many airplanes. If a designer were given such a part as a standard he would make the necessary adjustments and compromises, which are inherent in the design process. The airplane would not suffer, while the part in question, as a result of the thought of many engineers during its standardization, should be lighter, superior functionally, and better from the production standpoint than with individual design. With larger requirements the tooling can be more extensive and the production cost less; sometimes only one half or one quarter. Thus is created another "building block". A large slice of design time can be devoted to improving the arrangement and basic structure of the airplane.

Such an extension of the standards field carries one important implication. Work of this type normally cannot be done effectively by our "standards" engineer, though his co-operation is quite essential; it is a task for our design engineers working co-operatively. Thus if we are to realize the further great gains possible by large production of many airplane components not now standard, a certain amount of time and effort must be allowed designers for standardization activities. Their active participation in such work would render it more realistic and of high quality; it would also assist in breaking down present barriers to this fertile and profitable field.

Co-operative Effort Essential to Development of Standards

One of the striking developments of the recent past has been the broadening application of the standardizing principle, sometimes without the conscious intent of standardization. This is natural when one realizes that standardization is fundamentally the organization of our thoughts, knowledge, and requirements on a given problem in an orderly, logical manner and arriving at the best solution taking all pertinent factors into account. It has one important connotation; namely, that it is normally a co-operative act involving give and take between men with varying viewpoints.

Conditions for Testing Airplane Equipment.—An example that is of current interest and of far-reaching importance is the work being done by a subcommittee of the West Coast Aircraft War Production Council (AWPC) under the chairmanship of Harold Adams of Douglas. This group, composed of leading technical specialists and designers from several companies, is preparing a specification setting forth limiting environmental conditions, such as extremes of temperature, pressure, humidity, vibration, and dirt, for which aircraft equipment shall be tested. Four supplementary specifications are being prepared to cover conditions peculiar to each of the following: Electrical, hydraulic, mechanical, and heat-exchanger equipment. In addition, specifications are being written describing general methods of test to determine the degree to which equipment meets the limiting conditions. A number of these specifications are now being circulated to airplane companies throughout the country, to equipment manufacturers, and to the Military Services for their comments. After completion of this work, the technical subcommittees of the Society of Automotive Engineers (SAE) will prepare, as required, detail specifications for the test of specific items of equipment.

That the results of this program, participated in by representatives of all interested parties, will have a marked influence on aircraft-equipment development appears clear. The problems of the vendor are simplified; he has to meet one set of conditions agreed on by industry, not as many sets as he has customers. A known measuring stick is set up permitting an engineering evaluation of his product. Uniform methods of test should allow acceptance of test results made in any reputable laboratory and should go far to eliminate the present costly duplication of testing. A definite incentive is given the capable vendor to improve the quality of his product.

Spot-Welding Specification.—Another co-operative effort which promises to bear fruit has been the preparation of a new specification on spot-welding. Drawn up at the request of the West Coast-Aircraft War Production Council (AWPC) by experienced engineers, members of the Western Aircraft Welding Committee, it was co-ordinated with and approved by all major aircraft companies in the country. It was then presented to the Working Committee of the Aeronautical Board (WCAB) as representing industry's views on a technically sound speci-

fication for insuring quality production with reasonable requirements for control and qualification testing. It is believed that a specification prepared in this manner represents a better engineering document than can be formulated by an individual organization or by the Government alone. The degree to which this industry proposal is incorporated in the present Army specification on spot-welding may well determine the extent to which industry will go in preparing in a similar manner sound specifications covering a number of our basic aircraft-manufacturing processes. Such co-operative standardization work offers possibilities for raising quality levels in production and reducing costs throughout the aircraft industry.

Properties of Materials.—A final example of where the principle of standardization would perform a signal service lies in the field of materials. The subject is one of great interest to the author and was covered, as regards metals, in a recent article.[2] Great advances have been made during the war in the development of materials and their use, both from the design and fabricating standpoints. Conventional data and criteria concerning material properties have proved entirely inadequate and sometimes very misleading. For instance, it has become essential to know the mechanical properties of many metals both at and after being subjected to elevated temperatures; sometimes for functional design reasons, sometimes because of fabricating processes which may be facilitated by employing elevated temperatures. An outstanding unsatisfactory criterion is that for elongation based on a 2-in. gage length. Knowledge of this property may be of prime importance but the conventional information is often of little value.

It is proposed that a national agency first secure industry agreement on important criteria and methods of test to determine them. With these settled it becomes possible to obtain useful and accepted data through co-operative testing on the part of material vendors, users, and government agencies.

The next step is assembling in a carefully worked out standardized form all the data regarding each material, including not only technical data but procurement information on sources, standard and limiting sizes, and tolerances. As this is done for material after material, there will be built up over a period of a few years a single authoritative handbook which will contain in one place data, usually scattered through several sources, that can be referred to with confidence by the engineering, purchasing, inspection, and manufacturing departments of all companies and by government agencies.

In the coming years there will be few subjects of as vital importance to our industry as materials. By standardization of nomenclature, criteria, methods of test, and presentation of data, the aircraft industry can take a step of great importance in eliminating duplication of testing and discrepancies in design values often minor but nonetheless serious. The broader and more uniform dissemination of knowledge on materials will raise the quality of design and reduce general manufacturing costs.

Standardization Progress in Aircraft Industry

The past year particularly has seen a significant trend in standardization work which has made new demands and placed new and different responsibilities on those directing and participating in standards activities. This is brought about by the fact that aviation has assumed its place among the major industries of this country. This reality has had its impact upon many other industries and their associated trade and professional organizations, with a consequent tremendous problem of co-ordination.

The requirements of the aircraft industry for new products, for precision manufacture, for small-size and lightweight products, reliable under extremes of environmental conditions, forced technical collaboration. The necessity for functional and dimensional interchangeability of similar parts and equipment compelled standardization. The challenge was accepted by the SAE and NASC standards bodies.

A critical situation arose. In their desire to do their utmost for the war effort, the industries, suddenly called upon to manufacture products for aircraft, activated their trade associations and the technical societies through which they had previously worked. We realized the need and value of this assistance but the necessity was equally obvious for channeling it through established agencies already handling aircraft standards work if confusion and delay were to be avoided. The solution was a series of interlocking subcommittees on which were men serving in a liaison capacity; the objective was an integration of complex activities in many diverse industries.

For example, in the electrical field, the chairman of the NASC Electrical Installation subcommittee was made a member of the SAE Subcommittee A-2 on aircraft electrical equipment on which were likewise representatives of the American Institute of Electrical Engineers (AIEE) and the National Electrical Manufacturers Association (NEMA). Similarly, the two latter organizations had the same representatives on the NASC subcommittee on which were also SAE representatives from subcommittees A-2, A-4, and A-8, the latter two having jurisdiction over instruments and radio. It was such a tie-up which made possible the great and rapid progress in the electrical field with no duplication of effort.

These dealings with other long-established industries and organizations call for a considerable degree of both diplomacy and statesmanship. A nice judgment must be exercised at times when our views and practices conflict with those of the older organizations. Only in our own field can we expect directly to control our work and standards. In their fields the other industries must exercise such control even though we use the products. However, through foresight and a broad viewpoint we can exercise a marked influence and effective guidance with great benefit to the aircraft industry.

Electrical Graphical Symbols.—One of the most interesting cases of such influence was in connection with the standardization of electrical graphical symbols. For many years the powerful electrical communication, radio, and power industries had developed their own symbols, many peculiar to the single field, and had not been able to agree to a standard. Aircraft engineers had to interpret drawings from all three groups and in addition had their own symbols. A subcommittee of the American Standards Association (ASA), charged with the task of standardizing these

(*Concluded on page* 49)

[2] "Organizing Knowledge of Materials," by B. C. Boulton, *Product Engineering*, Feb., 1945, pp. 73-78.

"Inch" Screw Thread Practice Unified

International conference on unification of engineering standards reports historic agreement on unified basic thread form, as well as on specific types of threads

AGREEMENTS for unification of the basic screw thread systems of Great Britain, Canada, and the United States, reached at the international conference of engineering experts at Ottawa, Ontario, in the fall of 1945, made that conference an historic occasion. Had the unification of the British and American screw thread systems been accomplished following World War I, millions of dollars would have been saved the Allies during World War II, production would have been speeded, and lives saved. It is well known that urgently needed materiel was sometimes kept out of action for months waiting for replacement parts because the British and American screw thread standards, and other standards, were not interchangeable.

Work of 30 Years Led to Unification

For some 30 years, engineers in all the countries concerned have been working to bring about this unification. When the recommendations of the Ottawa conference are put into practice in these countries, their hopes will have been realized.

In addition to the agreement on unification of the basic screw thread form, the Ottawa conference reached agreements on many specific screw thread problems.

These recommendations of the conference are now being studied by committees of the national standardizing bodies in the three countries for possible adoption as national standards. In the United States, the ASA War Committee on Screw Threads and the Sectional Committee on Screw Threads, B1, working under the sponsorship of the American Society of Mechanical Engineers and the Society of Automotive Engineers heard reports on the projects considered at Ottawa, and referred the recommendations of the Ottawa conference to subcommittees on the specific subjects for action.

Combined Production and Resources Board Sponsored Meetings

The Ottawa conference, held September 24 through October 6, 1945 was the culmination of a series of meetings which were held under the auspices of the Combined Production and Resources Board and were made possible through the cooperation of the American Standards Association, the British Standards Institution, and the Canadian Standards Association. The first of these meetings was held in New York in 1943, when a British delegation visited this country. The second was held in London in the fall of 1944, when a joint United States-Canadian delegation visited England.

American industry owes a vote of thanks to the Combined Production and Resources Board for its aid in carrying on the work and making these meetings possible. Without the backing of the Board and the financial resources it supplied during the past three years, it would have been impossible for the United States-Canadian mission to have visited London; and it would have been equally impossible for the Ottawa conference to have been held on such a large scale. Representation at the meeting was broadened from a delegation of six that visited London in 1944 to approximately 100 technicians who met in Ottawa in the fall of 1945.

The vast amount of technical work done by committees in the United States in preparing reports and recommendations for consideration by the British and Canadians was one of the important reasons for the success of the conference. Also of supreme importance in making the conference a success was the great generosity, foresightedness, and willingness to compromise shown by the British delegation in presenting a proposal for unification of the two basic systems. It is difficult to estimate the cost to British industry of making the necessary change; but because it believed that the time for unification is at hand, the British delegation suggested the compromise which was accepted.

A complete report of the Ottawa conference is now being printed by the Government Printing Office, and copies will be available soon.

The agreements reached at the Ottawa conference are reported below in detail:

Screw Thread Unification—

The outstanding achievement of the Ottawa Conference was the agreement reached on the unification of the American and British thread systems. For a hundred years the British have used the Whitworth system. For some 80 years, American industry has used the thread system originally developed by William Sellers. The British system of coarse and fine threads, based on the Whitworth form, has an included angle of 55 degrees. The American system has a thread form with a 60-degree angle. There are differences also between the pitches associated in the American and British systems with a given thread diameter. The American coarse thread, for example, with a nominal diameter of ½ in., has 13 threads per inch, while the British

Whitworth Thread

Sellers Thread

½ in. coarse thread has 12 threads per inch. The British fine threads have pitches coarser than those of the corresponding American threads throughout their entire range of sizes from ¼ to 1½ in.

It has been realized for many years on both sides of the Atlantic, that unification of the American and British systems, with consequent interchangeability of threaded products, would have invaluable advantages.

Two unsuccessful efforts to arrive at such unification had been made previously, one in 1919 when a United States technical mission went to London, and again in 1926, when a British mission came to New York. Both these attempts to reach agreement were unsuccessful.

The agreement reached at the Ottawa conference was for a new basic form of thread with an angle of 60 degrees and rounded crest and root, the radius of the root of the screw being larger than the radius of its crest. Truncation of the crest of the screw is permissible. Threaded products made to this new form will be practically interchangeable with those having the same nominal diameter and pitch, made to the present American Standard. The British will have to change their thread angle from 55 to 60 degrees, for threads in all sizes.

In brief, the recommendations of the conference, which were developed with both technical and economic factors in mind, provide that the unified standard should have the following characteristics:

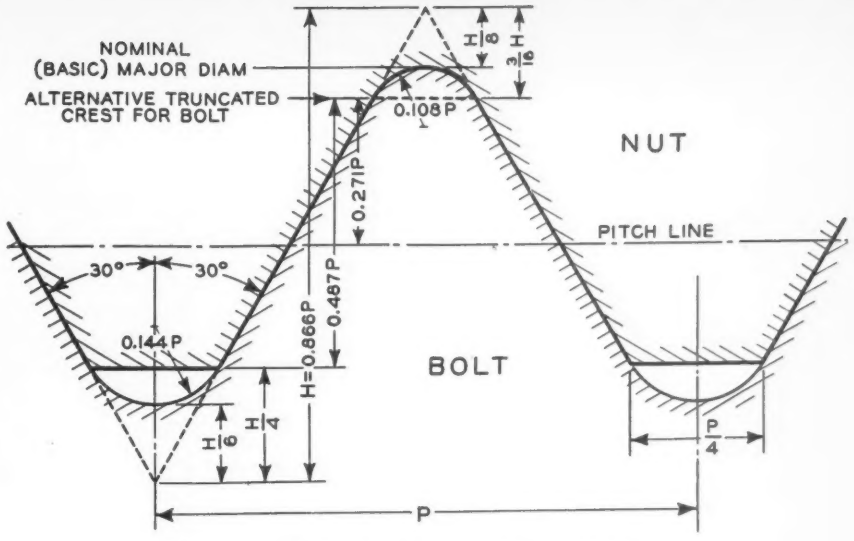
(*a*) A contained angle of thread of 60 degrees;

(*b*) A basic form with a radius at root of a magnitude approximating that at present associated with the Whitworth standard and a radius at crest equal to 0.108 times pitch;

(*c*) A truncated minor diameter of nut;

(*d*) A major diameter of screw truncated on an optional basis.

Agreement was reached in Ottawa, further, on a proposed system of coarse threads in nominal sizes from 0.086 in. (American Standard size No. 2) to 4 in., and fine threads in nominal sizes from 0.086 in. to 1½ in. The United States delegation made some concessions here by agreeing to a change in diameter in one case (0.216 to 0.220 in., for the No. 12 size), and a change in pitch in five other cases. The most important of these changes is that in the pitch of the ½ in. coarse thread, from 13 to 12 threads per inch. The British will have to change the pitches on all sizes of their fine threads from ¼ to 1½ in.



Proposed Basic Screw Thread Form

The proposed new unified basic form of thread has an angle of 60 degrees and a rounded crest and root. The radius of the root of the screw is larger than the radius of its crest. Truncation of the crest of the screw is permissible.

It was also proposed that the series of coarse and fine threads be supplemented in the smaller sizes by two other series. One of these proposed series covers the size range from 0.0118 in. to 0.0354 in. and is intended to be applied particularly to very small screws such as those used in watches, clocks, and instruments of various kinds. It was proposed that this series be made identical with the threads in sizes from 0.30 to 0.90 mm adopted some 20 years ago by the Swiss Horological Society (NHS standard) and widely used also in other countries, including the United States and Great Britain. These NHS threads have an angle of 50 degrees and pitches ranging from about 340 to 113 threads per inch.

The second series would cover the range of threads in sizes smaller than 0.086 in. from 0.0394 in. to 0.0787 in. This series is derived from the Swiss NHS series in sizes from 1.00 to 2.00 mm. which has a 60-degree thread angle.

It was decided at the Ottawa Conference that no proposal for a series of extra-fine threads would be made at this time.

In brief, the recommendations as to the screw thread series which should be adopted are as follows:

(1) For screws 0.0394 inch (1 mm) to 0.0787 inch (2 mm) the Systeme International series of diameters and pitches be adopted as first preference.

(2) For intermediate steps in this series, the additional diameters and pitches of the NHS series (NHS 56100, December, 1923), modified by amending the pitch on the 1.30 mm diameter from 0.3 mm to 0.25 mm, and omitting 1.60 mm size, be adopted as second preference.

These sizes serve as "repair sizes" for the first preference sizes of (1) above. The 0.086 diameter × 64 threads per inch will serve as a repair for size 0.079.

(3) For the ABC coarse and fine thread series above 0.0787 inch (2 mm) and below ¼ inch diameter, the existing ANC and ANF diameters and pitches be adopted, with the substitution of 0.220 inch diameter in place of 0.216 inch for the present U. S. No. 12 size.

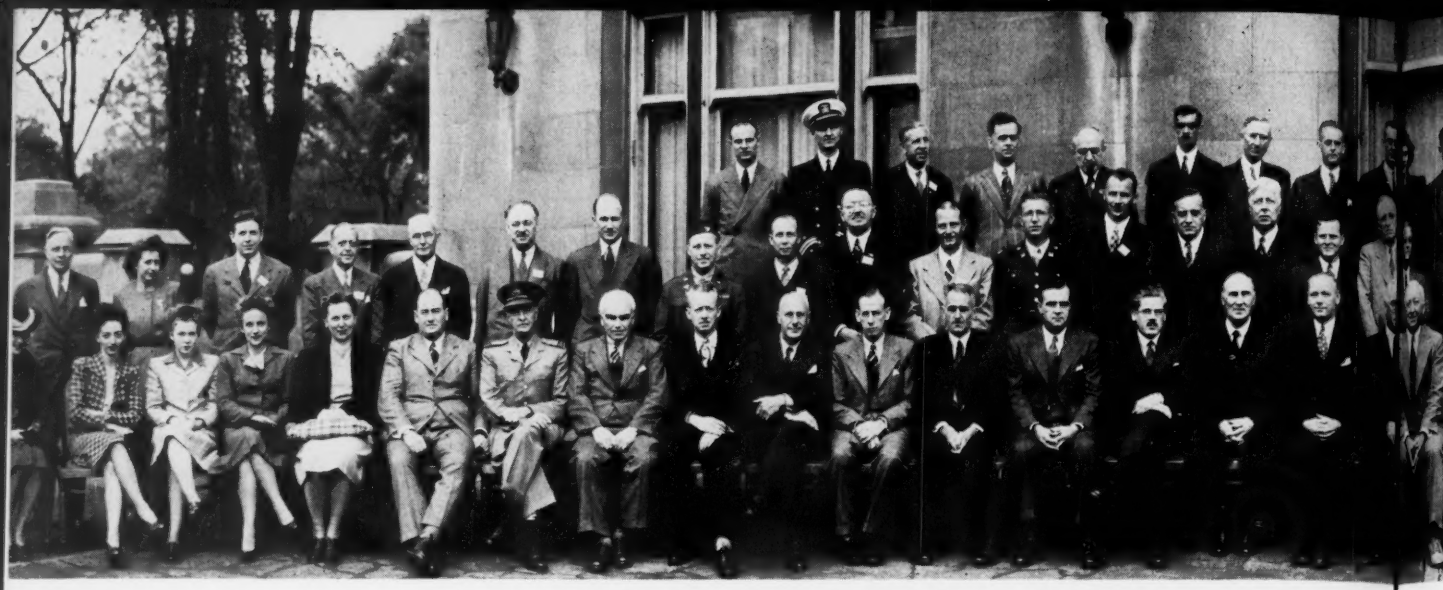
(4) The thread form throughout the above series be the new ABC form.

(5) The screws of the above series be known by their diametral sizes and not by arbitrary numbers.

(6) For the ABC coarse thread series ¼ inch diameter and larger, the existing British Standard Whitworth nominal diameters and pitches be adopted up to and including 2 inches diameter, and that for 2¼ inch diameter to 4 inch diameter inclusive, the existing American National Coarse diameters and pitches be adopted.

(7) For the ABC fine thread series the existing American National Fine diameters and pitches be adopted for the range ¼ inch to 1½ inch diameter inclusive with the substitution of 12 threads per inch instead of 14 threads per inch for the 1-inch diameter size.

(8) The standardizing bodies in the three countries should collaborate in preparing recommendations for preferred pitches and diameters to be used in cases where special screws have to be designed.



Some of the Delegates and Their Assistants at the Ott Con

Delegates who attended both the London and Ottawa Conferences are seated (with others) in the front row. Left to right, front row only: Miss G. E. Harrison, British Standards Institution (United Kingdom); four secretaries; James S. Blair, Stewarts & Lloyds, Ltd (United Kingdom); Flight Lt Douglas G. Moffitt,* Chief, Industrial Standardization, British Air Commission (United Kingdom); G. Howard Nash, Ministry of Aircraft Production (United Kingdom); James H. Boyd,* Combined Production and Resources Board; J. O. Almen,* Research Laboratories Division, General Motors Corp (United States); Norman R. K. Wheatley, Ministry of Aircraft Production (United Kingdom); Theodore K. Affleck, Technical Manager, Acton Tolt, Ltd (United Kingdom); Ronald Allwork,* Combined Production and Resources Board; Douglas G. Sopwith, Principal Scientific Officer, Engineering Division, National Physical Laboratory (United Kingdom); Frederick H. Rolt, Director of Jigs, Tools & Gages, Machine Tool Control, Ministry of Supply (United Kingdom); Paul J. DesJardins, Pratt & Whitney Division, Niles-Bement-Pond Co. (United States); James E. Baty, Technical Consultant, British Standards Institution (United Kingdom); Neil P. Petersen, President, Canadian Acme Screw and Gear, Ltd; (Canada); Stanley J. Harley, Technical Controller, Machine Tool Control, Ministry of Supply

These proposals, which were agreed to by the committee dealing with instrument threads, are set out in tables which are being published as part of the official report of the conference.

Screw Thread Research Program—

A cooperative research program was organized in 1944 in Great Britain, Canada, and the United States to determine the comparative strengths of threads of different forms, particularly the American National, and the British Standard Whitworth forms. Following agreement by the international conference on the unification of the screw thread forms, the research program became unnecessary as far as collection of data for the purpose of choosing a thread angle is concerned. It is being continued, however, to collect comparative data on the American National, British Standard Whitworth, and the newly proposed unified form of thread. It is also proposed to investigate the interchangeability between nuts of the proposed basic thread form and bolts of existing forms, and also to determine the strength of combinations of different thread forms that may occur during the transition period.

Screw Thread Nomenclature and Symbols—

Agreement was reached on a series of proposed screw thread symbols, including general symbols and pipe thread symbols. These symbols have been referred to a subcommittee of the ASA sectional committee on screw threads B1. It is expected that they will be used in all American War Standards and American Standards to be developed from now on. It is the recommendation of the conference that additional nomenclature and symbols needed by industrial or governmental standardizing groups be cleared through the national standardizing bodies in order that uniformity of action may be assured and the schedule of symbols kept up to date.

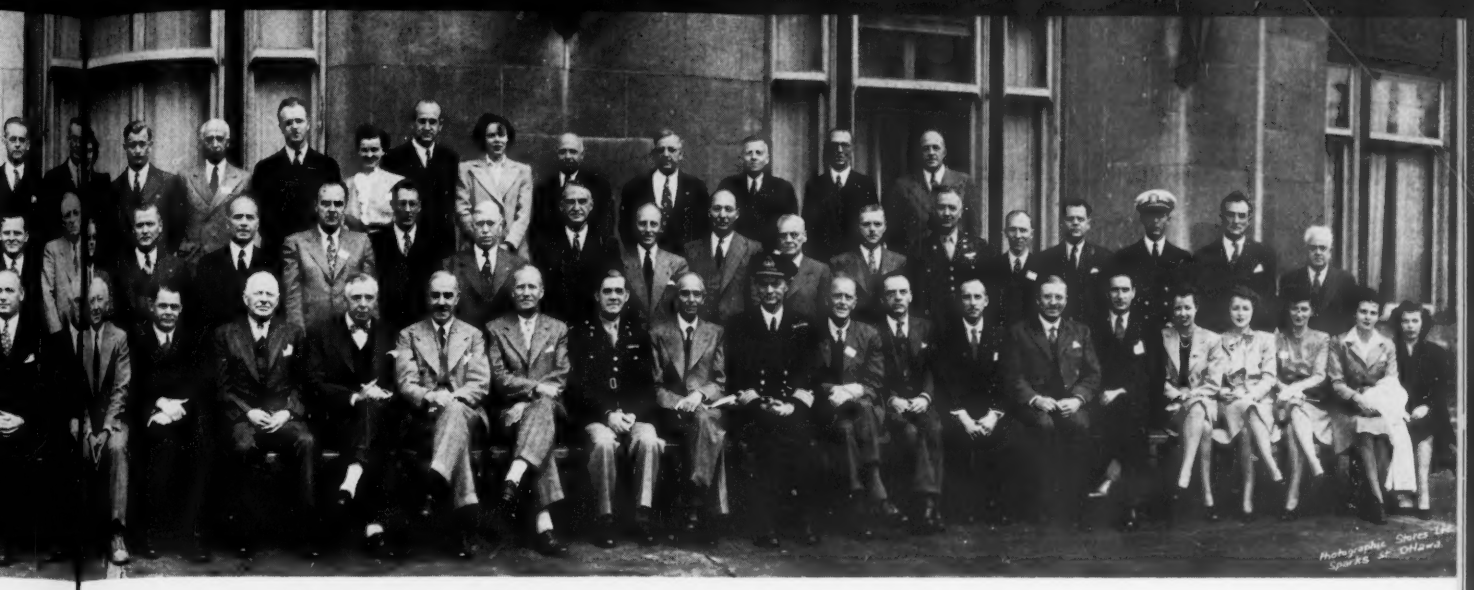
Truncated Whitworth Threads—

The series of international conferences on screw threads was started originally because of the necessity for unification of the standards of the United Kingdom and the United States for truncated Whitworth threads. Manufacturers in the United States had experienced considerable difficulty in producing British Whitworth screw threads for British materiel. Producing such threads required costly tool set up and the tools in general were difficult to procure.

At the conference in London in 1944 agreement was reached on the unification of British Standard No. 84 and the American War Standard B1.6-1944 covering screw threads of truncated Whitworth form. New material obtained by the British, and a question concerning the size of the allowance in the American War Standard brought the subject up again for discussion at the Ottawa conference. As a result, minor revisions were agreed upon which will bring the American War Standard, B1.6-1944, into complete agreement with the British Standard.

Acme and Stub Acme Threads—

The British Standards institution and the Canadian Standards Association have both adopted the American War Standard for Acme Threads, even though normally the British have a somewhat different method of calculating tolerances and allow-



Conference on Unification of Engineering Standards

(United Kingdom); James G. Morrow, Chairman, Canadian Standards Association (Canada); Elmer J. Bryant, Director of Research, Greenfield Tap & Die Corp (United States); Sir William Stanier, Chairman, Mechanical Industries Committee, British Standards Institution (United Kingdom); Cyril Ainsworth, Technical Director and Assistant Secretary, American Standards Association (United States); Colonel H. B. Hambleton, Chief Inspection & Engineering Administration, Branch, Office Chief of Ordnance (United States); P. Good, Director, British Standards Institution (United Kingdom); Captain G. C. Adams, R.N., Ministry of Supply & Admiralty (United Kingdom); John E. Sears, Superintendent, Metrology Division, National Physical Laboratory (United Kingdom); Frank E. Richardson, Senior Aeronautical Engineer, Headquarters Army Air Forces (United States); George A. Whipple, Managing Director, E. R. Watts & Son, Ltd (United Kingdom); Henry E. Lane, Ground Thread Tap Association and Cut Thread Screwing Tool Manufacturers Association (United Kingdom); Clemen M. Holloway, Engines Branch, Bristol Aeroplane Company (United Kingdom); five secretaries.

* Did not attend the London Conference.

ances. The American War Standard, B1.5-1945, has been circulated extensively throughout American industry, and has been put into practice widely in the aircraft industry, particularly on the West Coast. It is intended that certain parts of the standard will be clarified when it is converted from an American War Standard to an American Standard.

It was agreed that a final draft of a standard on Stub Acme Threads should be prepared by the American Standards Association and submitted to the British and Canadians before being finally approved.

Buttress Threads—

A proposal for a standard form of buttress thread, preferred series of diameters and pitches, formulas for calculating suitable tolerances and allowances, and a recommended system of gaging was prepared by the British Standards Institution following the 1944 conference in London, and was sent to the American Standards Association and the Canadian Standards Association for comment.

This British proposal was used by the ASA War Subcommittee on Buttress Threads in preparing a Proposed American War Standard for Buttress Threads. The proposed British specifications followed agreement reached at the London conference for a buttress thread designed particularly for use in applications involving exceptionally high stresses in one direction only, along the thread axis. According to this agreement, the thread form has an over-all depth of engagement of 0.4 pitch, a pressure face angle of 7 degrees, and the pressure face and back face connected by symmetrical radii of suitable proportions. The formula for calculating the effective diameter was the same as that used in British Standard 84-1940 (Screw Threads of Whitworth Form) but modified to suit the buttress thread and so arranged as to compromise the pitch diameter factors to meet the wide range of pitch-diameter relationships.

Three classes of fit—close, medium, and free—were proposed, with tolerances calculated on the basis of ten pitches engagement.

An alternative form with a vertical pressure flank thread was in demand, the British found, particularly for larger gun work and on high pressure steam valves. An appendix added to the draft standard, therefore, provides an alternative optional thread form having a vertical pressure flank.

These recommendations were accepted by the conference, and a unified standard is to be published in the form preferred by each country but with the understanding that the technical data are to be identical.

It was also agreed at the conference that the method of calculating tolerances and allowances as given in the British proposal should be accepted, but with the reservation that it might be reviewed in the light of any general change in basic formulas for tolerances and allowances in a unified standard.

Instrument Screw Threads—

The conference reached agreement for unification on threads for fastening screws; fine-motion screws; micrometric screws; threads for optical tubes and cells; and microscope objective thread (interchangeable with the widely used Royal Microscopical Society thread). These agreements were based on the Swiss Horological Society standards, in line with those described above for

the unification of the basic screw thread form.

Recommendations on the fastening screw thread series were:

(1) That the NHS thread series from 30 NHS (basic major diameter 0.30 mm or 0.0118 inch) to 90 NHS (basic major diameter 0.90 mm or 0.0354 inch) with a 50-degree thread angle be adopted as the small screw series; but that the tolerances on these threads be established by agreement.

(2) That the NHS thread series from 1 millimeter to 2 millimeters, having a 60-degree thread angle, be permitted for use by the watch and clock industry.

(3) That the subcommittee on unification, in considering a new series of fine threads having the proposed new basic form, should include in their recommendations a series for diameters down to 0.036 inch.

(4) That, if possible, the diameters and pitches in such a series should be developed to follow closely the NHS series for diameters 0.079 to 0.039 inch.

Gaging practices for small screws, particularly the NHS series, and including the question of thread tolerances and dimensions, should be discussed with the Swiss, it was decided.

On fine motion screws it was recommended that the new proposed basic form of thread should be used, and that consideration should be given to the adoption of decimal inch diameters, particularly for sizes below ¼ inch. Two series of pitches (first choice and second choice) were recommended for fine motion screws, and for precision screws used for measuring instruments where results depend on accuracy of pitch and where there must be a definite relationship between rotation and translation.

In order to facilitate the supply of taps and dies, three series of nominal diameters (first, second, and third choice) were recommended.

On bearing adjusting screws, it was agreed that the diameters and pitches should be chosen from the series recommended for fastening screws or fine motion screws.

Optical component screw threads were considered under three separate headings: Major optical component screw threads; minor optical component screw threads; optical constructional screw threads.

The major optical component screw threads included microscope objective screw threads, and screw threads for photographic or camera lens mountings.

British and American standards vary widely for screw threads for photographic or camera lens mountings. In order to bring about uniformity, it was recommended that the existing standards be studied with a view toward establishment of new standards, giving particular attention to diameters, pitches, the proposed new basic thread form, and length of threads to shoulder.

For minor optical components, such as lens accessories, shutter cable release gear, between-the-lens shutters, and the like, it was recommended that the new basic screw thread form be adopted, and that the dimensions for such threads be based on the inch unit.

Agreement was reached on a common series of pitches for optical constructional threads on tubes and cells, to be used with the proposed new basic thread form.

On tripod mounting threads for surveying and similar equipment, it was found that the Service departments of the three countries had adopted separate standards. It was therefore recommended that the Service departments of all three countries be asked to reconsider their standards for tripod mounting threads with a view toward unification of practice.

The use of the proposed basic thread form in the development of standard screw threads for mounting cameras and similar equipment on stands or tripods was referred to the standardizing organizations in each of the three countries.

> "The fundamental differences between British and American screw thread forms were resolved . . . with a specification for a basic thread form that would provide a unified standard for all countries employing the 'inch' system. At the same time, a series of associated diameters and pitches were developed which, it is believed, will simplify existing practice and yet provide an adequate range of choice for all general requirements. The proposed basic screw thread form involves the minimum amount of departure from existing practice consistent with the obtaining of the objective—a common standard for general purpose threads for the inch system of measurement."
>
> —Final report, Conference on Unification of Engineering Standards, Ottawa, Canada, September-October, 1945.

Subjects Discussed But Further Action Needed

A number of additional subjects were discussed without reaching decisions for unification of the national practices. The discussions were helpful in clarifying the viewpoint of each country, however, and it is expected that they will help to promote future unification. Pipe threads, compressed gas cylinder valves, cylindrical fits, metrology, drafting room practice, and high duty studs in light alloys are among these subjects.

Pipe Threads—

An American subcommittee had developed a proposal for "international" pipe threads intended as a compromise between British Standard pipe threads and American Standard pipe threads, in the range of nominal sizes below 4 inches. Since no consensus on this proposal had been reached in the United States before the Ottawa meetings, the United States delegation could merely discuss this subject as a technical matter, without being able to make any formal commitments. This subject is to be discussed further.

Consideration is also being given to the adoption of an international series of pipe threads in nominal sizes of 4 inches and larger. In this range, the American Standard is widely used since it has been adopted by the American petroleum industry and thus has spread throughout the world. After the Ottawa conference, this series of pipe threads was discussed by the British delegation and a committee of the American Petroleum Institute at a meeting in Chicago.

In the Ottawa discussions it was shown that this problem is particularly important since it involves an immense production of all sorts of threaded products, not only the threading of pipe and couplings, elbows, and simple fittings. It was decided that until a final agreement can be reached in both countries, no proposed international standard will

be published. In as many ways as possible, however, the industries of each of the countries concerned will be informed of the standard practices of the others.

The discussion on the subject indicated that the first step to a solution of this problem might be through an analysis of the change-over cost in the three countries, and that there would be an advantage in bringing about the desired unification gradually, as and when the new tools are introduced.

The conference recommended that every possible step be taken toward unification of the screw thread practices of the three countries, and that attention be given to both the national and international aspects of the problem.

Threads for Compressed Gas Cylinder Valves—

A comprehensive report on the work done by a committee of the Compressed Gas Manufacturers Association on standardization of threads on valves for compressed gas cylinders for 25 gases was submitted by the American delegation to the Ottawa conference. Standards for the cylinder valves for 8 additional gases are being studied, it was reported. The difficulty that the British encountered in making adaptors for American cylinders during the war had originally brought this subject before the international meetings. British specifications for gas cylinder screw threads and valve seatings had been standardized, but there had been no such action in the United States. In the meantime, however, the problem of producing adaptors in order that British valves would fit on American cylinders, and vice versa, was solved. Despite the fact that this meant that the international standardization was no longer so vitally important, it was found desirable to encourage continued exchange of data on the subject between the two countries. For this reason the subject was discussed at the Ottawa conference.

Following the discussions, the conference requested the American Standards Association to invite the inch-using countries in the United Nations Standards Coordinating Committee to arrange for an early discussion on standards for valve fittings for compressed gas cylinders. It also recommended that when this conference takes place, the standardization of cylinder valves for gases for medical purposes should be considered to make it impossible to connect the wrong gas cylinder to any piece of medical apparatus, but to assure interchangeability between the cylinders for the same gases in all countries. It also recommended standardization of the methods of identification.

Cylindrical Fits—

During the last few years, a revision of the American Tentative Standard of 1925, and a revision of the British Standard of 1924, have been under consideration. Efforts have been made to arrive at a unified standard, Limits and Fits for Engineering and Manufacturing, to be developed in the United States as an American War Standard. It appeared at the Ottawa Conference that there was no prospect of immediate agreement on this subject. However, cooperation looking toward possible future agreement will continue. After the Ottawa conference, American, British, and Canadian delegates met in New York and reached tentative agreement on definitions. It was agreed that immediate steps would be taken to prepare the proposed American Standard for circulation.

Metrology in Mechanical Engineering—

Methods of gaging, inspection, and gaging equipment were discussed as a subject complementary to that on cylindrical fits. During the year considerable data had been prepared for the consideration of the delegates by the United States Army Ordnance Department, and the document on checking positional gages, "Notes on the Use of Circular Dividing Apparatus for Angular and Linear Measurements," prepared by Dr. G. P. Barnard of the National Physical Laboratory, had been carefully examined in the United States.

Discussion of a paper "Progress in Precision Measurement in the United States," by Lt Col W. J. Darmody, brought out the close relationship between metrology and the setting up of dimensional standards for products such as screw threads. In this connection, mention was made of the development in Great Britain of a series of optical instruments similar to those of Carl Zeiss and of equal or greater accuracy. The British delegates explained that, both prior to and during the war, steps had been taken in the United Kingdom to ensure an adequate supply of slip gages, bench comparators, multigages, automatic gaging machines, and optical projectors.

A series of papers presented at the conference formed the basis for a discussion on comparison of precision measuring methods used in the various countries. The accuracy of measurements on both sides of the Atlantic is comparable, in the opinion of those present, although there are differences in the methods of attacking problems and in the equipment used.

The American delegation offered a paper on "Suggestions for Coordination of United States, United Kingdom, and Canadian Practices for Precision Measurements". It was suggested during the discussions that conditions under which measurements of different types of gages are made should be standardized, and that no controlling conditions other than that of the standard temperatures need be stated in reporting the size.

It was suggested that specifications similar to those developed by the British Standards Institution should be developed in Canada and in the United States.

It was agreed that the three countries should continue to collaborate closely with each other in the development of improved methods and equipment; and it was suggested that a conference on metrology alone, to last several days, might be arranged.

Drafting Room Practice—

Early in 1945, in response to invitations from the American Society of Mechanical Engineers and the Society of Automotive Engineers, C. E. Gladman of the National Physical Laboratory paid a visit to the United States and Canada for the purpose of presenting his paper, "Drawing Office Practice in Relation to Interchangeable Production," to groups of engineers in some 20 cities. This paper was also presented during the year at a number of centers in the United Kingdom under the auspices of the Institution of Mechanical Engineers. At the request of the U.S. War and Navy Departments the American Standards Association formed a war committee to study the whole problem. At the same time an Ordnance Manual on Dimensioning and Tolerancing was prepared by the Inspection Gage Sub-Office of the U.S. Chief of Ordnance.

A subcommittee of the Sectional Committee on Drawing and Drafting

Room Practice had been appointed to study Mr. Gladman's paper and to report its comments on the principles discussed. This subcommittee prepared "A Critical Review of Drafting Room Practice in Relation to Interchangeable Components" for presentation at the Ottawa conference. The discussions at the conference centered principally around this document. The need for a universal system of nomenclature and definitions relating to drawing practice, limits and fits, etc, was emphasized and it was agreed that the American and Canadian delegates would review the comprehensive set of definitions prepared by the British.

The conference recommended that the standards bodies in the three countries should cooperate closely in establishing a standard code for the dimensioning and tolerancing of industrial drawings acceptable to the three countries.

High Duty Studs in Light Alloys—

Discussion of this subject was rather in the nature of an exchange of information on practices in the United States and Great Britain. The approach to the problem of establishing tight fits between threads on steel studs and tapped holes in aluminum and magnesium castings and forgings is basically different in Great Britain and the United States. Moreover, practice in the United States varies widely with the companies in the aircraft and other industries, and additional work will have to be done in this country before the question of international agreement can be considered.

The American delegation explained that a survey of aircraft engine manufacturers showed that the shop practice of several manufacturers in the use of studs conformed closely to the recommendations set forth in the SAE Aeronautical Recommended Practice ARP 142. Due to the progress made during the war, studs must generally have a load-carrying ability of 1½ to 2 times that previously required. It was believed that this could be accomplished by pre-stressing the stud in an advantageous direction. Fatigue conditions could also be improved by increasing the amount of thread engagement, since practically all studs are subject to lateral forces. It was also suggested that the first two threads should be tapered to relieve the stress.

Research on the use of studs in steel has shown that the best results are obtained by using a tapered stud approximately 0.040 per inch included angle taper, although this presents additional problems in controlling the tapped hole. The use of stud drivers was discussed, and it was indicated that a machine is needed to control automatically the torque of the stud when driving it.

A survey of leading British aircraft engine builders showed that they generally approve the principles on which British Standard 1171 has been formulated, the British delegation reported. Information obtained in Great Britain on torque driving practice, however, shows that hand rather than machine drivers are in general use.

The Canadian delegation stated that because of the relatively small quota of airplane engines produced in Canada, highly stressed studs are not widely used. The Canadian Standards Association will recommend, for use in Canada, the standard for high duty studs that may ultimately be agreed upon by the British Standards Institution and the American Standards Association.

The conference agreed that a great deal of exploratory work is still necessary in this field. The British will review British Standard 1171, which is based on standard studs in conjunction with undersize holes, when further information is available. The United States will continue to use SAE ARP 142, in which the minimum hole is basic size and the stud oversize, and will continue its inquiries into the necessity for relating interference with grades of hardness met with in various light alloys. It was recommended that the three countries continue to collaborate in this work and furnish each other with information through normal channels; that the study of torque drivers be continued; and that the use of tapered studs in light alloys be investigated.

Miscellaneous Screw Thread Forms—

The British delegation reviewed a tentative British Specification BSI CH (ME) 1235 on Rolled Sheet Metal Threads and Associated Moulded Plastic and Die-Cast Threads and a British Specification BSI CH (TE) on Round Threads. No specification on either subject exists in the United States or Canada. It was recommended, therefore, that these subjects be referred to the United Nations Standards Coordinating Committee.

New Company Standards Committee to Hold First Meeting March 22

The first meeting of the new Company Standards Committee is scheduled for March 22 in the Engineering Societies Building, New York, to consider the procedure to be followed by the committee in carrying on its future program.

Howard Coonley, newly elected chairman of the ASA Executive Committee, will speak on the relation of the individual companies to the future plans of the American Standards Association.

It is expected that the committee will consider a list of subjects to take up at future meetings.

The organization meeting of the Company Member Committee is being limited to a small group of those previously interested in the Company Member Forum. It is expected that other Company Members of ASA will be invited to join the committee as soon as the organization has progressed to the point where this increased activity can be properly handled.

Dr Brickwedde Heads NBS Power Division

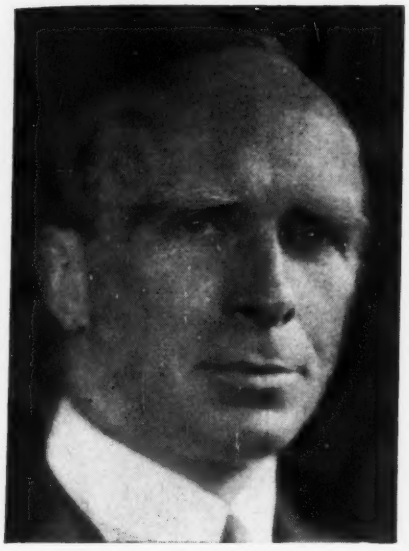
Dr Ferdinand G. Brickwedde has been designated as the new chief of the Heat and Power Division of the National Bureau of Standards to succeed Dr H. C. Dickinson who has retired.

Dr Brickwedde has been with the Bureau since 1925. His early work was in the Colorimetry Section but he soon took charge of the low temperature laboratory. He is principally known for his cryogenic researches and studies in fundamental thermodynamics and for the part he played in the discovery of heavy hydrogen. In March, 1941, he received the annual Hillebrand Prize of the Chemical Society of Washington for his work on deuterium and its compounds, and the award of the Washington Academy of Sciences for distinguished services in physics.

ASA Board Elects Four New Members

The ASA Board of Directors has elected four new members:

Clarence L. Collens, chairman of the Board of the Reliance Electric and Engineering Company,



Clarence L. Collens

nominated by the National Electrical Manufacturers Association.

Dr Edward U. Condon, director of the National Bureau of Standards, nominated by the Secretary of Commerce.

George H. Taber, Jr., president of the Sinclair Refining Company, nominated by the American Petroleum Institute.

Evans Ward, president of the Russell, Burdsall & Ward Bolt and Nut Company, nominated by the American Institute of Bolt, Nut and Rivet Manufacturers.

Mr Collens is well-known to ASA, having served as a member of the Board of Directors on several previous occasions. A former president of the National Electrical Manufacturers Association and a member of the Board, he is a familiar figure in the electrical industry. Equally active in Cleveland as a member of the Board of the Cleveland Chamber of Commerce and president of the Associated Industries of Cleveland, he has recently resigned as president of the Reliance Electric and Engineering Company to be elected chairman of the Board.

Dr Condon is the newly appointed director of the National Bureau of Standards, completing the unexpired term of Dr Lyman J. Briggs, who has retired. He is also one of the world's outstanding authorities in nuclear physics, having worked with such men as Dr R. W. Gurney of the faculty of the University of Bristol, England, and Dr James Franck, Nobel Prize winner.

Recently elected president of the American Physical Society and named Technical Advisor to the Senate Committee on Atomic Energy, Dr Condon was also one of three scientists who were presented with a scroll for their work in the development of atomic energy by the National Conference of the Sciences, Professions, Arts, and White Collar Organizations.

Dr Edward A. Condon

Mr Taber has worked in many branches of the petroleum industry since his graduation from the University of Pennsylvania and the Massachusetts Institute of Technology. At present the president of the Sinclair Refining Company, he was for many years vice president of the company in charge of refining operations. In addition, he is a member of the American Society of Mechanical Engineers, American Chemical Society, Society of Automotive Engineers, and the American Institute of Mining and Metallurgical Engineers.

Mr Ward is president of the Russell, Burdsall & Ward Bolt and Nut Company of Port Chester.

In addition to the three members of the Board already elected, nominations are being made by the Copper and Brass Research Association and the National Machine Tool Builders Association.

The organizations nominating the new Board members replace the American Institute of Electrical Engineers, the American Gas Association, the Association of American Railroads, and the ASA Fire Protection Group.

Expiration of the term of the ASA Fire Protection Group brought with it the retirement from the Board of Directors of Alvah Small who had represented the Group on the Board, except for a brief period, since 1931. Mr Small, who had also served on the Standards Council continuously since 1926, is president of Underwriters' Laboratories, Inc. At its last meeting the Standards Council expressed its appreciation of Mr Small's long service to the American Standards Association by adopting a resolution which said: "Alvah Small, through his close attention to the many problems facing the American Standards Association during its critical formative period and through his criticism and advice, has contributed immeasurably to the policies on which the growth of the Association has been built."

George H. Taber, Jr

Statistics Put to Use—

Revised Standard Will Help Bring about Uniformity in Computing and Reporting Industrial Injury Rates

By Walter S. Paine

ONE of the most useful branches of political science is that of statistics. This science has now become indispensable to the conduct of almost every branch of social and economic activity. Statistical analyses play important roles in education, agriculture, insurance, transportation, banking, and industry. The real practical value of these data depends upon their separation into homogeneous classifications to fit the objective sought. The value of such data are totally dependent on accuracy and the volume of the specific information desired.

To aid the field of conservation of life, health, and property so as to ascertain the real destructive force causing the terrible social and economic loss from accidents, the Standards Council of the American Standards Association on October 11, 1945 approved a revision of the American Standard Method of Compiling Industrial Injury Rates, Z16.1-1937. This approval marked an important forward step in the efforts to secure uniform injury statistics for all industries. As this method gains acceptance throughout industry, comparable information about the industrial injury experience of the country will be available to safety engineers both as an indication of progress and safety and as an index of the relative hazard existing in different industries and organizations.

Standardization and codification of industrial injury statistics has been of interest since the earliest days of the safety movement. Immediately after organized safety work was initiated with the formation of the National Safety Council, in 1913, a Committee on Standard Forms was appointed by the Council. Almost at the same time a Committee on Statistics was created by the International Association of Industrial Accident Boards and Commissions. The two committees cooperated through joint conferences in formulating definitions of a reportable injury, methods of computing industrial injury frequency and severity rates, and a classification of accident causes.

In 1918, the National Safety Council published its first standard record system, Safe Practices Pamphlet 21. In 1920, the several reports of the IAIABC Committee were gathered together into one bulletin, published by the U. S. Department of Labor, under the title *Standardization of Industrial Accident Statistics.* These two publications established fundamental principles of accident reporting which still hold, despite some modifications and much elaboration.

Walter S. Paine is vice president for industrial safety of the National Safety Council, one of the three sponsors for the ASA project on Standardization of Methods of Recording and Compiling Accident Statistics. He is also manager of the Engineering and Inspection Department of the Aetna Casualty and Surety Company and a national figure in all phases of accident prevention work. He therefore speaks with authority on the subject of accident statistics.

As time went on, need was felt for more precise definitions of reportable injuries and rate computation methods. Consequently, in the early 1930's, a new committee was formed, this time under the direction of the American Standards Association. The three leading organizations in the safety field, the National Safety Council, the National Council on Compensation Insurance, and the International Association of Industrial Accident Boards and Commissions, undertook the sponsorship of a code to answer the many questions of interpretation which had arisen over the years. In 1937, this code was adopted and has been the standard for reporting procedure ever since.

The growth of workmen's compensation coverage was often accompanied by accentuation of differences in rulings between states. Consequently, industrial safety engineers came more and more to believe that the basic rule of reportability in the 1937 code, namely, whether or not compensation was paid the claimant, tended to produce differences in rates which did not reflect differences in accident prevention achievement. The demand for a code which would help to attain uniformity in the midst of many differing interpretations gained force as discrepancies accumulated. After many conferences and deliberations by the committees of the American Standards Association, the National Safety Council, and other interested groups, the present revision of the code was submitted to the Association last spring.

The fundamental difference between the present code and its predecessor is that decisions regarding reportability of injuries are now independent of workmen's compensation decisions. This was an essential step in the attainment of uniformity. Therefore, in place of workmen's compensation rulings, an extensive set of definitions stating under what conditions an injury suffered by an employee should be reportable are given.

The definitions make no change in the standard provision that injuries sustained by employees in the course of and arising out of employment should be classified as industrial injuries. They undertake, though, to define more precisely what is meant by this phrase. Under the provisions of the code, "in the course of employment" means all time spent by employees in performing the work for which they were employed, together with voluntary work undertaken by them while on duty with the intention of benefiting their employer. It also includes time spent before and after working hours while going to or from the work place while on company property, or from one part of the plant to another

during working hours. In formulating the definition in this way, the committee undertook to define as clearly as possible three types of "border-line" cases:

1. The case of the employee who undertakes work not assigned to him in order to "help out".
2. The case of the employee who is injured on company property before he reaches his work place.
3. The case of the employee who is injured while not engaged in productive work but while walking from one part of the plant to another in the course of his business.

The general definition is followed by a number of special definitions dealing with questions that have often arisen in the past regarding the reportability. These include such subjects as employees living on employer's premises, parking lot cases, injuries during working hours but outside of company property, problems involving workers called for special duty, participation in athletic activities, hernia, fights, and animal bites or infections.

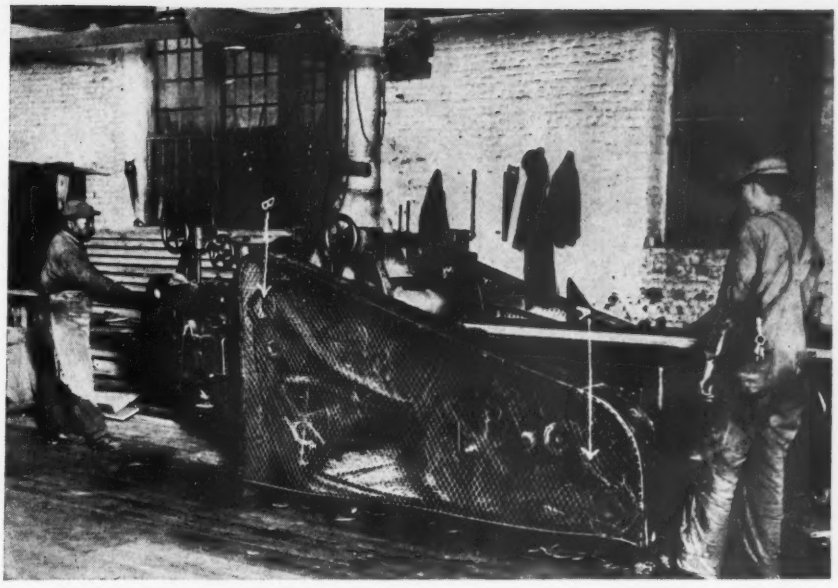
The classifications of industrial injuries by severity remain practically unchanged in principle, though they are elaborated to assist the safety engineer in solving the border-line cases.

Time charges remain unchanged from the previous code, except for the addition of a time charge for the amputation of toes other than the great toe.

Another important provision in the new code is the setting of definite closing dates for injury records covering a certain period. The committee believes that one of the important sources of non-uniformity was the fact that some firms closed records immediately at the end of the year regardless of the number of cases pending, while other firms kept their records open for several months.

To supplement the definitions and take care of doubtful cases which do not seem to be clearly covered by the definitions, a committee on interpretations has been provided. Any organization which is in doubt about the reportability of any alleged injury may submit the facts to this committee for advice or decision.

In a field where so many differences in practice have existed in the past, it is perhaps too much to expect that everyone using the code will be in full agreement with all its provisions. Certain points of compromise have been necessary throughout the entire development of the standard. However, if, despite occasional differences of opinion, industry will generally adopt the code, and conscientiously conform to its provisions, most of the present uncertainty about comparability of records will be eliminated. The Interpretations Committee affords a means not only of securing interpretations but also of bringing to the attention of the ASA Sectional Committee any difficulties which may be encountered in administering the code. Provision is made for this in the last paragraph, which states: "These records shall be reviewed annually and the precedents established shall be incorporated in this code."



An accident which might have resulted in lost-time injuries. The arrows show where a belt broke on a double surfacer in the Norfolk Navy Yard. The workmen were well protected, however, by the wire mesh guard.

In order to avoid the confusion which might result from making the code retroactive to the date of its adoption, the National Safety Council is recommending that the new standard be put into effect on January 1, 1946.

In conclusion, a brief quotation from the introduction to the code best expresses its purpose and usefulness:

"This code provides a practical and uniform basis for recording and measuring industrial injury experience. Injury rates compiled in accordance with this code may be used to evaluate:

(*a*) The relative need for accident prevention activities in different departments of an establishment;

(*b*) The seriousness of the accident problem in an establishment or industry;

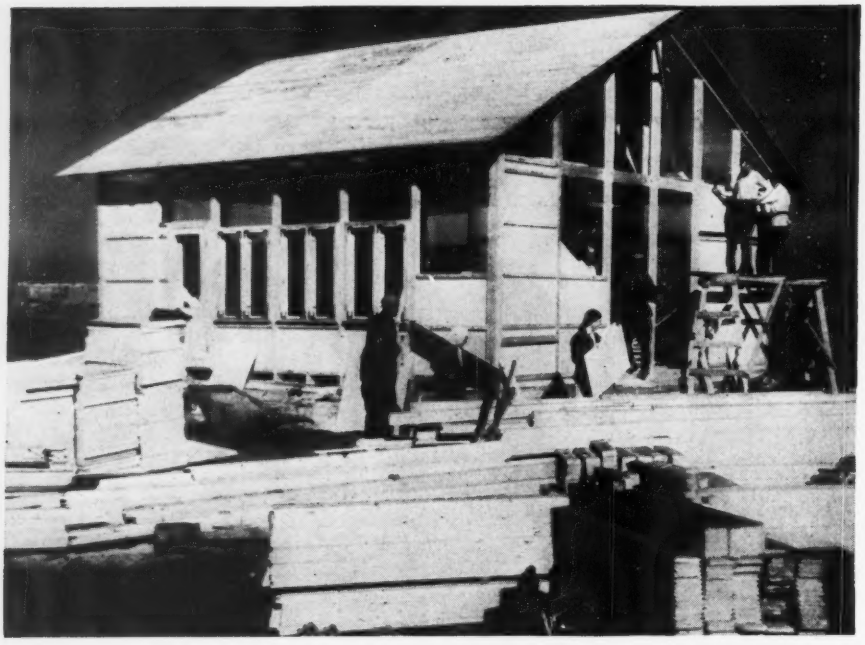
(*c*) The effectiveness of safety activities in establishments with comparable hazards;

(*d*) The progress made in accident prevention within an establishment or industry."

Every industrial safety engineer is urged to use this code to insure practicability of injury rates, for only in this way can genuine uniformity and comparability of rates be obtained. The cooperation on the part of all engineers and statisticians will go far to center our efforts on those causes which are producing the great social and economic loss of life, health, and property through accidents.

The new edition of the American Standard Method of Compiling Industrial Injury Rates, Z16.1-1945, can be obtained from the American Standards Association at 20 cents per copy. The American Recommended Practice, Compiling Industrial Accident Causes, Z16.2-1941, is issued in two parts, and is available at $1.00 per copy for the entire standard. Part 1 covers Selection of Accident Factors; Part 2 is Detailed Classification of Accident Factors.

News from Other Countries



Standard houses being built for automobile workers at Dniepropetrovsk. Readymade parts are used, and a house is assembled in several days.

Standardization and Prefabrication Aid Building Program in Russia

THE Soviet program for prefabricated houses, medical institutions, and schools went forward rapidly when devastation of whole areas in Western Russia made it necessary to move large segments of the population to other places.

The *Soviet War News*, in a recent article, tells of the achievements of engineers Pavlov and Popovich, and architect Sholomov, who with their respective staffs in a very short time designed and built prefabricated dwelling houses and public buildings with a total floor space of 100,000 square yards under the severe climatic conditions of the Urals.

After the Germans had been defeated at Stalingrad, the article says, the rapid restoration of the Volga city became a matter of extreme urgency. The job was entrusted to the building organization, which had performed so efficiently in the Ural region. There the sawdust and shavings from the timber mills, and the huge dumps of slag and limestone deposits were the basic raw materials from which all house parts and heat insulation were provided.

When the engineers received the Stalingrad assignment, they packed up and left the Urals taking with them several truckloads of prefabicated components and a number of prefabricated houses for their workers. The *News* reports that with a trained staff they arrived in the devastated city equipped to work at once among the ruins. There were no factories, no sources of power, yet in six months they not only succeeded in rebuilding the first sections of the "Red October" plant, where some of the heaviest fighting in the Stalingrad battle occurred, the article declares, but also built a complete little township with floor space amounting to 30,000 square yards.

The Stalingrad experiences proved valuable to the little building organization from the Urals, it is stated, in evolving better methods for construction in other areas.

The unusual success of this prefabrication project was due to a number of factors, the article states. The units were simple to manufacture and easily joined together. Standardization of the dimensions of all components, so that all measurements were multiples of one another, greatly simplified the manufacturing process, and transformed the erection job itself into an industrial process. So as to reduce the amount of work to be done on the building site, the outside wall units were made complete at the factory strong enough to carry the weight of the roof and to afford insulation; the outer sides were also decorated at the factory.

The internal walls were built as panels, designed for strength and for sound insulation, with simple junctions at walls, floors, and ceilings. The upper and lower connecting elements (wood strips or boards) were designed to serve as supports for ceiling and floor beams as well as to join the wall panels. Other elements of the house were also prefabricated—ceiling panels, rafters, porches, shutters. All were finished as completely as possible, so that nothing was necessary on the site but to assemble them, the article explains.

Close collaboration between the designing engineers and builders has resulted in constant improvements being made in the original designs, so that the time required for erection has been steadily reduced and houses have cheapened in price, the article declares.

The work of assembly is also organized for speed. Where large numbers of houses are going up, special gangs of workers have been trained to go from house to house, performing exactly the same job on each house, as though working on a conveyor. This method of specializing on a particular job gives high productivity, and avoids the loss of time inevitable when inexperienced people are transferred from one type of work to another, it is explained. There is no unnecessary bustle at the building site, and the number of workers is limited to those actually necessary for the work of erection.

The similarity of the jobs done by the workers, the sequence in which they are done, and the standardization of the elements have enabled the

building gangs to decrease steadily the building time and to improve the quality of their work.

Although building materials vary with the area, the prefabricated housing program is being realized just as successfully in Kuibyshev, or in Moscow, as it was in the Urals and Stalingrad due to the use of standard interchangeable parts and the employment of universal principles, the *Soviet War News* declares.

England Studies Standardization To Speed Building of Schools

WHERE there is a need for houses, there is a concomitant need for schools, The *Architects' Journal*, London, emphasizes in a recent article describing the emergency in the school field in Great Britain. The overriding demand in Britain today is for houses, yet to carry out the British postwar education program an immense variety of new school building must be initiated, it declares. Emergency measures must be taken in regard to schools in much the same way as with houses.

Standardization has aided in the rapid construction of houses, and for similar aid in the building of schools, the article states, "the report of the Ministry of Works, Building Studies No. 2, Standard Construction for Schools, is being investigated."[1]

[1] For a more detailed description of the Ministry of Works building studies, see INDUSTRIAL STANDARDIZATION, March 1945, page 65.

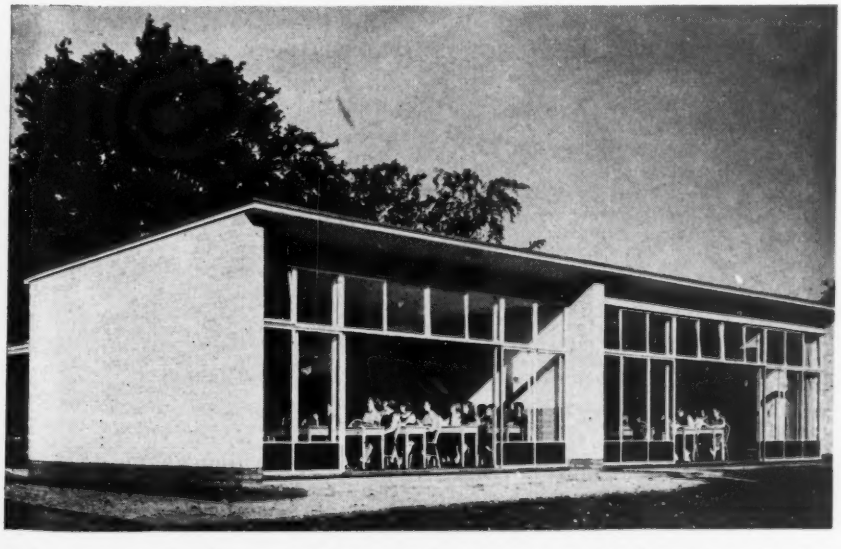
In terms of labor and materials, an average size primary school may be equal to between 20 and 30 houses; and a secondary school equal to about 100 houses, the *Journal* explains. The architects conceive the school as shown in the ministry report "as not being an integrated framework, but as a combination of separate units—plan units—designed to provide for the several requirements of the three main categories of school accommodation. These plan units could be connected up if the site permitted, by standard corridor connection, or where this was impossible, by *in situ* work as might be required."

School Too Large to Be Treated as Mass Production Unit

From the point of view of mass production, the school is too large to be treated as one unit for standardization, the *Journal* explains. Furthermore, standardization as a whole endangers the first principle of modern school design—maximum flexibility. Correct lighting, ventilation, and sound insulation are dependent upon site variations, levels, and orientation.

The lengths to which standardization will be carried in the construction of schools depend on the whole building program procedure, it is explained. Design must keep pace with development and it will benefit design if architects can make fullest use of local resources and are allowed to use their discretion in obtaining a balance between individual design and standardized construction, the *Architects' Journal* suggests.

If the school is considered as a group of buildings made up of a number of standardized units linked together where necessary by *in situ* work, then a common dimensional factor or grid cannot be usefully applied to the whole, the article says. In the case of the design described, no modular dimension has been used, since an entire bay width of a suitable size and shape is taken as the standard special unit. This bay width is then multiplied and repeated with minor variations to make up any length of building. It is then divided internally according to the number and size of rooms required. The span of the unit can be varied between 22 ft and 24 ft without alteration to the framework or roof, according to whether the external walling is placed on the inside face of the stanchion or allowed to run past on the outside. The bay widths are at 8 ft centers, and the height from floor to ceiling 10 ft, 6 in., but these dimensions are not critical to the principles of the design. Multiples of this unit are capable of accommodating every description of teaching and non-teaching space required in all types of schools, except assembly halls and gymnasia, the article declares. These are larger units and must be treated independently. The proposed construction for halls, staff rooms, lavatories, medical inspection rooms, and other components of the modern school based upon the standard bay unit principle is discussed. Freedom in the choice of materials is proposed in the report as well as individual initiative upon the part of the engineering and architectural staffs to revise standardized design to changing conditions.



Classes being held in one of the standard types of school units now being constructed in England. The sliding glass panels are open.

Standard Clothes Poles for British Wash Days

The morning wash in Britain will soon be hung at a standard height if present plans materialize. The whole idea is recommended by a body known as the Codes of Practice Committee for Civil Engineering, Public Works and Building, sponsored by the Ministry of Works which collaborates with the British Standards Institution in establishing the agreed best practice for building methods and standards for building materials and components.

This proposed standard for Clothes Props is being worked on by a subcommittee of experts whose usual line is timber, steel, and concrete.

World Standards for World Sales

"Of far-reaching significance to industry is the recent and little-publicized meeting of the United Nations Standards Committee. From the eventual success of this committee will come decisions that will simplify export and import trade, and open new markets to American firms. The objectives are to set the foundation for wider agreement as to standards in testing, specifications, and dimensions.

"In the past, the lack of standards in terminology, tests, specifications has added enormously to the problems and cost of doing business abroad. Sellers have been forced to tailor-make items to individual specifications, often at high cost. Buyers have never been sure of getting exactly what they order.

"Proposals now before the UNSC indicate the scope and the need for such work if world trade is to flow freely at higher levels than ever before."—*Modern Industry.*

Australia Plans Change to Standard Railway Gage

Plans are now being formulated for the alteration of Australian railway gages to make them uniform to the 4 ft 8½ in. standard. This decision was affirmed only after much debate by members of the Premiers' Conference where the motion was first submitted.

While most of the Premiers agreed that rail unification was advisable, they opposed the suggestion that the Australian States should bear four-fifths of the cost—particularly at this time when such expense might interfere with the housing program and other urgent works. Others hastened to reply that many millions of pounds would have to be spent in bringing the railways up to date as a result of postponed replacement and repair during the war, irrespective of whether standardization was agreed to. If a standard gage were ever to be adopted, this would be the time to proceed, they declared.

Sir Harold Clapp, who submitted the report with the recommendation for standardization, pointed to the necessity for development of proper railways to aid in the absorption of migrants to the country. His report was also based upon military advice citing the fact that, at present, a pool of locomotives and equipment in the southern states could not be moved beyond their borders because of the lack of standardized gages. It took 36 days to move a division from Sidney to Perth and required 62 trains. With a standard gage the movement would take 7 days and only 51 trains.

New Committee to Study Use of Metric Units

As the result of a formal request from Ebasco Services, Inc, the Standards Council has appointed a committee to study the use of metric units in standards.

L. F. Adams, National Electrical Manufacturers Association, *Chairman*
W. C. Mueller, American Society of Mechanical Engineers
C. N. Hoagland, National Machine Tool Builders Association
Dr. N. B. Sease, Photographic Group
J. R. Townsend, American Society for Testing Materials

It is expected that this "fact-finding" committee will seek the advice not only of members of the Standards Council, but also members of industry who are not Council members.

ASA Staff Titles Changed

In line with the steps being taken by the American Standards Association in reorganization for postwar operations, the Board of Directors has authorized the following changes in staff titles in order to make them more accurately indicative of present duties.

Vice president and secretary—P. G. Agnew (formerly secretary)
Technical director and assistant secretary—Cyril Ainsworth (formerly assistant secretary)

Dryden Is Named Assistant Director Of National Bureau of Standards

THE National Bureau of Standards recently announced the appointments of Dr Hugh L. Dryden as Assistant Director of the Bureau and Dr Henry T. Wensel as Assistant to the Director. Dr Dryden's services will supplement those of E. C. Crittenden who has served as Assistant Director for many years and who will continue in that capacity. Dr Wensel will coordinate all Bureau activities relating to atomic energy.

Dr Dryden came to the Bureau as a laboratory assistant in 1918, and in only two years was placed in charge of the Aerodynamics Section. He became chief of the Mechanics and Sound Division in 1934 and will continue in that capacity.

Outside the Bureau, he is perhaps best known for his research on air flow. He was chosen to deliver the Wright Brothers Lecture in 1938, and in 1941 received the Sylvanus Albert Reed Award of the Institute of the Aeronautical Sciences. On December 1, 1942, he was elected president of the Institute. Much of Dr Dryden's research work has been on problems submitted by the National Advisory Committee for Aeronautics, and he is the author or co-author of many of the Committee's reports.

Dr Wensel first joined the Bureau's staff in 1917, and became chief of the Pyrometry Section in 1926. In 1940 he was selected to assist Dr Briggs in the work of the original Uranium (S-1) Committee. Since 1942, he has been largely occupied with the administrative work of the Manhattan District, U.S. Army Corps of Engineers. He was also acting chief of the Heat and Power Division.

(*Continued from page* 35)

symbols, finally invited two representatives of the aircraft industry, including Mr. Warren Boughton, chairman of the NASC electrical subcommittee, to participate in the job.[3] Their advent greatly expedited the work. It proved possible to secure agreement on and to issue a war emergency standard covering all fundamental symbols for the entire electrical industry of this country. So was established a common engineering language, and wiring diagrams could be intelligible to all. In this instance, as in the case of surface-finish standards, the American Standards Association acted as a co-ordinating body.

Cylindrical Fits.—A further important example of the value of the ASA in performing this function is the War Emergency Standard on cylindrical fits which was also co-ordinated with the British Standards Institution and in large part accepted. It is strongly recommended that further recognition be given to the ASA as a national co-ordinating body on standards affecting several industries.

Requirements for Successful Standardization Effort

In all this work co-operation is the keynote. Each group must recognize the real interests of the other groups and direct its efforts so that these basic interests are promoted and not injured. Throughout the give and take involved, clear thinking and firmness are required so that the requirements of technical quality necessary for aircraft are obtained.

If a true picture has been presented it should be clearly evident that the aircraft industry must be represented by broad-gage technically qualified men. They must be big enough to submerge petty professional jealousies, to see that full credit, or even more, for accomplishments goes to the other fellow. It is just as evident that between the standards bodies representing the aircraft industry there must be harmony. Care must be exercised by each to avoid encroaching on the other's bailiwick and each must be quick to support the other.

In a recent article, Charles E. Wilson, president of General Electric and past vice chairman of the War Production Board, said, "One of the really priceless dividends we derive from the last few years is a demonstration of the fact that industry can co-operate intelligently with Government. Let us extend that co-operation indefinitely—."

Ranking high in importance to the war effort has been the standardization work of the SAE and NASC organizations. Their efforts have provided many a specification for urgently needed new materials where no recognized specification previously existed. Standardization of aluminum-alloy and steel tubing sizes, of extrusions, of new rolled shapes prevented shortages so critical that they threatened disruption of airplane production lines. Elimination of hundreds of special requirements not only largely stepped up mill production but resulted in substantial decreases in production costs. Scores of standard parts have been developed and improvements worked out on existing AN standards. In addition to this work on materials and parts our industry has devoted long, patient, and co-ordinated effort to the development of specifications controlling the preparation of drawings, technical data furnished the Government, and to a standard airplane procurement specification. In the great bulk of all this work co-ordination has been through the Working Committee of the Aeronautical Board (WCAB).

The Working Committee of the Aeronautical Board

The over-all effort has been great, corresponding to the stakes, and reflects high credit on engineers throughout the aircraft industry who accomplished it, and on engineering management which authorized it. Nor has it been any sinecure for either the Working Committee of the Aeronautical Board or industry due in large part to initial differences in approach to problems. There have been discouraging moments when it seemed as if some of these endeavors were in vain. Patience and understanding were present on both sides in these mutual efforts on the part of industry and the WCAB. The former came to appreciate better the problems of co-ordination between the Services and other Government agencies, and of huge procurement which faced the WCAB which had to be resolved. On the other hand, it is believed that the latter came to appreciate the sincerity and technical competence of industry's work and its value to them and acquired an understanding of industry's problems and viewpoint. Between the two groups has grown up a mutual liking and respect and a realization of the need one has for the other.

Following Mr. Wilson's thought, many of us would like to see this hard-won relationship develop into a genuine partnership between the WCAB and the aircraft industry on standardization matters. We would like to see a further strengthening of the authority and technical responsibility of the WCAB in handling standards work for both military services. When one Service only is interested in the development of a new standard, if it could be discussed within the Board by the representatives of the Service concerned, it is believed that the difficulties sometimes encountered in obtaining agreement on a common standard, should the other Service later wish to adopt it, would be much reduced. The day may come, and before too long, when industry is invited to have representatives on the WCAB and we may have ANI-Army, Navy, Industry standards.

The practical success of such a proposal requires maintenance of mutual confidence, of continued technical competence and a broad viewpoint on the part of industry, and of an understanding appreciation of and consideration for industry's interests and problems on the part of the WCAB. It is difficult to appraise the potentialities in such a broad development for improving the technical quality of both military and commercial aircraft, for reducing their cost, and for simplifying stocking and maintenance work in the far-flung airports of the world where our future commercial and military airplanes will be serviced.

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[3] The American War Standard Coordination of Electrical Graphical Symbols, Z32.11-1944, was prepared by an ASA War Committee, of which Mr. Boughton was a member. Peacetime standards are prepared by a sectional committee sponsored by the American Society of Electrical Engineers and the American Society of Mechanical Engineers.

NOTE. The author wishes to acknowledge the suggestions and helpful criticism received from Warren V. Boughton of Douglas, and Glen M. Aron of Northrop in the preparation of this paper, and also the assistance given by L. J. Catlin of Douglas, C. T. Torresen of North American, W. H. Korff and R. R. Richolt of Lockheed in supplying information and data for the examples given in the paper.

ASA Standards Activities . . .

American Standards

Standards Being Considered by ASA for Approval

Drawings and Drafting Room Practice, Z14.1
Sponsors: American Society of Mechanical Engineers; Society for the Promotion of Engineering Education

Gear Tolerances and Inspection, B6.6
Sponsors: American Gear Manufacturers Association; American Society of Mechanical Engineers

Graphical Symbols for Electric Power and Control, Z32.3 (Revision of Z32.3-1943)
Sponsors: American Institute of Electrical Engineers; American Society of Mechanical Engineers

Method for Determining Photographic Speed and Speed Number (Revision of Z38.2.1-1943)

Method for Determining Spectral Sensitivity Indexes and Group Numbers for Photographic Emulsions, Z38.2.4

Diffuse Transmission Density, Z38.2.5
Sponsor: Optical Society of America

Standards Submitted to ASA for Approval

Building Code Requirements for Reinforced Concrete, A89 (ACI 318-41)
Sponsor: American Concrete Institute

Photography

Emulsion and Sound Record Positions in Camera—Negative for 35-Mm Sound Motion Picture Film (Revision of Z22.2-1941 to be designated as American Standard Emulsion and Sound Record Positions in Camera for 35-Mm Sound Motion Picture Film, Z22.2)

Emulsion and Sound Record Positions in Projector—Positive for Direct Front Projection for 35-Mm Sound Motion Picture Film (Revision of Z22.3-1941 to be designated as American Standard Emulsion and Sound Record Positions in Projector for 35-Mm Sound Motion Picture Film, Z22.3)

Emulsion Position in Camera—Negative for 16-Mm Silent Motion Picture Film (Revision of Z22.9-1941 to be designated as American Standard Emulsion Position in Camera for 16-Mm Silent Motion Picture Film, Z22.9)

Emulsion and Sound Record Positions in Camera—Negative for 16-Mm Sound Motion Picture Film (Revision of Z22.15-1941 to be designated as American Standard Emulsion and Sound Record Positions in Camera for 16-Mm Sound Motion Picture Film, Z22.15)

Emulsion Position in Camera—Negative for 8-Mm Silent Motion Picture Film (Revision of Z22.21-1941 to be designated as American Standard Emulsion Position in Camera for 8-Mm Silent Motion Picture Film, Z22.21)

Theater Projection Rooms (Revision of American Recommended Practice Z22.28-1941 to be designated as American Standard Practice for Projection Rooms and Lenses for Motion Picture Theaters, Z22.28)

Theater Projection Screens (Revision of American Recommended Practice Z22.29-1941 to be designated as American Standard Practice Dimensions of Theater Projection Screens, Z22.29)

Safety Film (Revision of American Recommended Practice Z22.31-1941 to be designated as American Standard Practice for Motion Picture Safety Film, Z22.31)
Sponsor: Society of Motion Picture Engineers.

American War Standards Submitted for Approval as American Standards

Method of Determining Freedom from Travel Ghost in 16-Mm Sound Motion Picture Projectors, Z52.4-1944 (To be designated as American Standard Z22.54)

Method of Determining Resolving Power of 16-Mm Motion Picture Projector Lenses, Z52.5-1944 (To be designated as American Standard Z22.53)

Specification for Multi-frequency Test Film Used for Field Testing 16-Mm Sound Motion Picture Projection Equipment, Z52.8-1944 (To be designated as American Standard Z22.44)

Specification for 3000-Cycle Flutter Test Film for 16-Mm Sound Motion Picture Projectors, Z52.9-1944 (To be designated as American Standard Z22.43)

Specification for Sound-Focusing Test Films for 16-Mm Sound Motion Picture Projection Equipment, Z52.11-1944 (To be designated as American Standard Z22.42)

Method of Making Intermodulation Tests on Variable Density 16-Mm Sound Motion Picture Prints, Z52.15-1944 (To be designated as American Standard Z22.51)

Sound Records and Scanning Area of 16-Mm Sound Motion Picture Prints, Z52.16-1944 (To be designated as American Standard Z22.41)

Specification for 400-Cycle Signal Level Test Film for 16-Mm Sound Motion Picture Projection Equipment, Z52.17-1944 (To be designated as American Standard Z22.45)

Reduction Printing from 35-Mm to 16-Mm Motion Picture Film—16-Mm Positive Aperture Dimensions and Image Size for Positive Prints Made from 35-Mm Negatives, Z52.24-1944 (To be designated as American Standard Z22.46)

Reduction Printing from 35-Mm to 16-Mm Motion Picture Film—Negative Aperture Dimensions and Image Size for 16-Mm Duplicate Negatives Made from 35-Mm Positive Prints, Z52.25-1944 (To be designated as American Standard Z22.46)

Contact Printing of 16-Mm Motion Picture Film—Printer Aperture Dimensions for Contact Printing 16-Mm Positive Prints from 16-Mm Negatives, Z52.26-1944 (To be designated American Standard Z22.48)

Contact Printing of 16-Mm Motion Picture Film—Printer Aperture Dimensions for Reversal and Color Reversal Duplicate Prints, Z52.27-1944 (To be designated as Z22.49)

Reel Spindles for 16-Mm Motion Picture Projectors, Z52.34-1945 (To be designated as American Standard Z22.50)

Sound Records and Scanning Area of 35-Mm Sound Motion Picture Prints, Z52.36-1945 (To be designated as American Standard Z22.40)

Method of Making Cross-Modulation Tests on Variable Area 16-Mm Sound Motion Picture Prints, Z52.39-1944 (To be designated as American Standard Z22.52)
Sponsor: Society of Motion Picture Engineers.

New Project Requested

Standards for Use in Business Offices (Requested by the National Office Management Association)

American War Standards

American War Standards Approved Since Our January Issue

Exposure Time Markings for Between-the-Lens Shutters Used in Still Picture Cameras, Z52.62-1946

Method of Determining Performance Characteristics of Between-the-Lens Shutters Used in Still Picture Cameras, Z52.63-1946

Method of Determining Performance Characteristics of Focal-Plane Shutters Used in Still Cameras, Z52.65-1946

Direct Finder Aperture for 35-Mm Motion Picture Cameras, Z52.68-1946

War Standards Under Way

Allowable Concentration of Trichloroethylene, Z37

Photography and Cinematography, Z52

Motion Picture Cameras

Auxiliary Finder Aperture for 35-Mm Motion Picture Cameras, Z52.69

Location and Size of Picture Aperture of 16-Mm Sound Motion Picture Camera, Z52.47

Location and Size of Picture Aperture of 16-Mm Silent Motion Picture Cameras, Z52.48

Mounting Dimensions for 16-Mm Camera and Recorder Film Mazagines (400-Foot Gear-Driven Type), Z52.52

Mounting Dimensions for 16-Mm Camera and Recorder Magazines (200-Foot Belt-Driven Types), Z52.66

Mounting Dimensions for 16-Mm Camera and Recorder Magazines (400-Foot Belt-Driven Type), Z52.67

Registration Distance and Mounting Dimensions for 16-Mm Motion Picture Camera Lenses, Z52.50.

War Standards Under Way—(Continued)

Base Point for Distance (Focusing) Scales for Lenses for 16-Mm Motion Picture Cameras, Z52.51
View Finders for 16-Mm Motion Picture Cameras, Z52.49

Motion Picture Projection Equipment
Class II Service Model 16-Mm Sound Motion Picture Projection Equipment, Specification for, Z52.13

Motion Picture Release Prints
Leaders and Trailers for 16-Mm Sound Motion Picture Release Prints Made from 16-Mm Original Material, Z52.31
Printer Loss in 16-Mm Sound Motion Picture Prints, Method of Determining, Z52.40

Motion Picture Test Films
Marble Test Film Used for Testing 16-Mm Sound Motion Picture Equipment, Specification for, Z52.32

Still Cameras
Exposure-Time Markings for Focal-Plane Shutters, Z52.64

Still Printing Equipment
Enlarger, Photographic, Specification for, Z52.23

Radio Noise, Methods of Measuring, C63
Safety Code for the Industrial Use of X-Rays, Z54
Use and Storage of Radium in the Field of Industrial Radiography, Part II
Methods and Materials of X-Ray Protection, Part III
Specific Applications for 400 Kv and Lower, Part IV
X-Ray Protection for Voltages of One and Two Millions, Part V
Electrical Protection, Part VI

Screw Threads, B1
Buttress Threads
High-Duty Studs in Light Alloys
Instrument Threads
Stub Acme Threads
Unification of Screw Threads

Women's Industrial Clothing, L17
Jackets for Outdoor Wear (Slide Fastener Closure), L17.6
Jackets for Outdoor Wear (Fly-Type Button Closure), L17.5

Wood Poles, 05
Ultimate Fiber Stresses of Wood Poles, 05aWS

News About ASA Projects

Allowable Concentrations of Toxic Dust and Gases, Z37—

At a meeting of the sectional committee in November, the five American War Standards were referred to subcommitees of the sectional committee for study as to their suitability for approval as American Standards. These five American War Standards cover cadmium, manganese, metallic arsenic, and arsenic trioxide, xylene, and styrene monomer.

The proposed standard on trichloroethylene has been sent to letter ballot of the sectional committee.

Work is being continued by subcommittees on fluorine and fluorides, silica, methyl chloride, and radium and radon gas. It has been suggested that new substances to be studied by the committee include sulfur dioxide, welding fumes, nitroparafine, chlorine, chlorinated napthalenes, and cyclohexame, cyclohexanol, and cyclohexanone. The chairman was authorized to appoint subcommittees to develop standards on these substances.

The committee re-elected William P. Yant, chairman, and Dr. C. D. Selby, vice chairman. Henry G. Lamb, safety engineer on the staff of the American Standards Association, was named secretary replacing Cyril Ainsworth, who is now technical director and assistant secretary of the American Standards Association.

Acoustical Measurements and Terminology, Z24—

Sponsor: Acoustical Society of America.

Dr. L. L. Beranek, Electro-Acoustic Laboratory, Harvard University, has been named chairman of Subcommittee B on Fundamental Sound Measurements of the Sectional Committee on Acoustical Measurements and Terminology. W. H. Deacy, American Standards Association, is secretary.

Building Code Requirements for Fire Protection and Fire Resistance, A51—

Sponsors: National Board of Fire Underwriters; National Fire Protection Association; National Bureau of Standards.

Four subcommittees have been appointed to work on definitions, protection of openings, roofing, and interior wall and ceiling finishes and insulation.

Construction and Maintenance of Ladders and Stairs for Mines, M12.1—

Sponsor: American Mining Congress.

The proposed American Standard, a revision of the 1928 edition, has been sent to letter ballot of the sectional committee.

Grandstands, Tents, and Other Places of Outdoor Assembly, Z20—

Sponsors: Building Officials Conference of America, Inc; National Fire Protection Association.

This proposed standard has been sent to letter ballot of the sectional committee for final approval.

Photography, Z52—

Four American War Standards are now being considered by a subcommittee of the peacetime sectional committee on standardization in the field of photography, Z38, for recommendation as to whether they should be approved as American Standards. These war standards are: Specification for Service Model Photographic Exposure Meters (Reflected-Light, Photelectric Type), Z52.12-1944; Acceptance of Photographic Exposure Meters (Reflected-Light, Photoelectric Type), Z52.21-1944; Calibration of Photographic Exposure Meters (Reflected-Light, Photoelectric Type), Z52.22-1944; and Abuse-Testing Mechanism for Photographic Exposure Meters, Z52.30-1944.

Reinforced Concrete, A89—

Sponsor: American Concrete Institute.

The American Concrete Institute has submitted its standard building regulations for reinforced concrete (ACI 318-41) for approval as an American Standard under the existing standards method.

When an organization submits a standard prepared under its own procedure to the American Standards Association under this method, it is required to furnish evidence that there has been a consensus of the organizations concerned. Future revisions will be handled by the sponsor organization and submitted to ASA.

This is the fourth edition of the code, the first edition having been published in 1925. During the past 15 years it has been widely used as the basis for the provision on reinforced concrete in practically all state and municipal codes.

If the standard is approved by ASA, it will become one of the series of building codes now being prepared under the jurisdiction of the Building Code Correlating Committee.

Safety Code for Bakery Equipment, Z50—

Sponsor: American Society of Bakery Engineers.

A complete draft of the proposed Safety Code for Bakery Equipment is being considered at a meeting of the sectional committee February 19.

Screw Threads, B1—

The proposed standards on which the ASA War Committee on Screw Threads has been working are being transferred to the sectional committee for consideration as peacetime standards. As fast as the war subcommittees complete the final drafts as agreed upon at the conference in Ottawa, they will be presented to the sectional committee.

Standards for Use in Business Offices—

A formal request from the National Office Management Association for standards for various phases of office operations, including office furniture, machines, forms, and records, etc., is now being considered by the American Standards Association. The need for such standards has been under discussion for some time. It was discussed in some detail at a meeting of the ASA Company Member Forum in 1939 by E. B. Gage. Mr. Gage is now active in the work of the National Office Management Association.

NEMA Elects White

Newly elected president of the National Electrical Manufacturers Association for the coming year is R. L. White, president, Landers, Frary & Clark, New Britain, Connecticut.

Mr. White has been widely associated with the electrical manufacturing industry since his graduation from Harvard in 1920. For the last two years he has been on the Board of Governors.

Additional Timber Species Now Standard

for WOOD POLES

New American War Standard Specifications and Dimensions for Wood Poles—Miscellaneous Conifers supplement the regular standard species of pole timbers. Include material requirements, dimensions, manufacturing requirements, storage and handling, and definition of terms.

the series of wood pole standards . . . .

American Standard Ultimate Fiber Stresses of Wood Poles (05a-1933; reaffirmed 1945) 10¢

American Standard Specifications and Dimensions for Northern White Cedar Poles (05.1-1941; reaffirmed 1945) 20¢

American Standard Specifications and Dimensions for Western Red Cedar Poles (05.2-1941; reaffirmed 1945) 20¢

American Standard Specifications and Dimensions for Chestnut Poles (05.3-1941; reaffirmed 1945) 20¢

American Standard Specifications and Dimensions for Southern Pine Poles (05.4-1941; reaffirmed 1945) 20¢

American Standard Specifications and Dimensions for Douglas Fir Poles (05.6-1941; reaffirmed 1945) 20¢

American Standard Specifications and Dimensions for Wood Poles—Miscellaneous Conifers (05.7-1945) 30¢

American Standards Association, 70 East 45th Street, New York 17, N. Y.